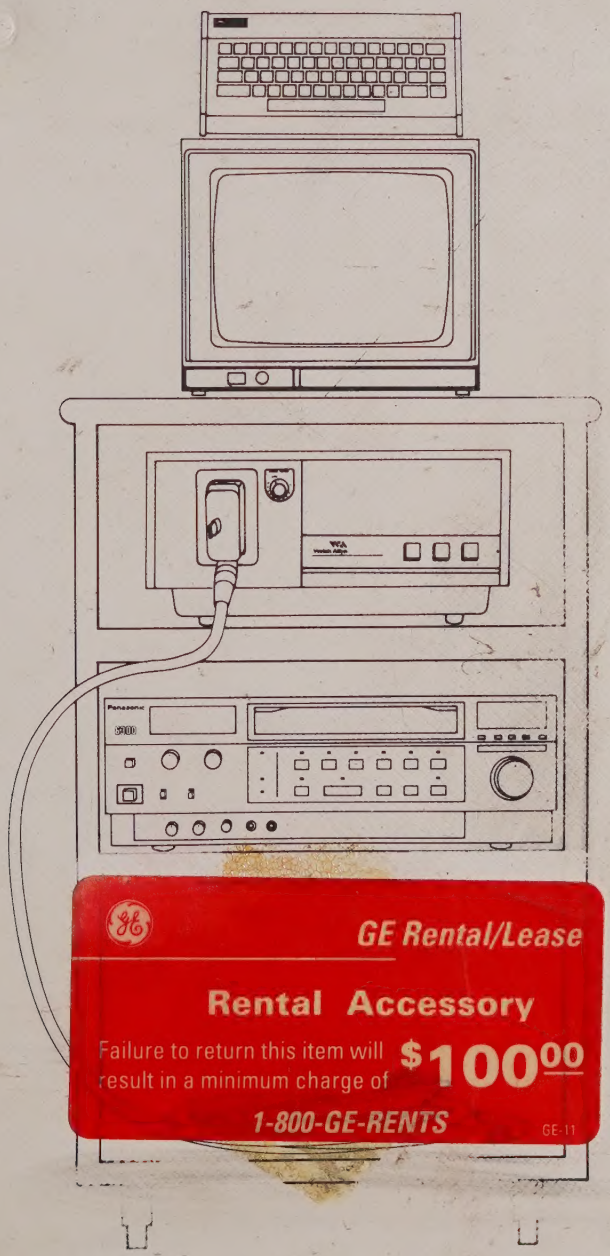
Welch Allyn

VideoProbe™ 2000
Instruction Manual



MASTER

Welch Allyn

VideoProbe™ 2000

The Welch Allyn VideoProbe System contains the world's first electronic imaging probes. We believe that with proper care the VideoProbe System will give you many years of satisfactory service.

This instruction manual is broad based and covers all models of VideoProbes and accessories. Your VideoProbe system may not include all items listed.

Important: The Welch Allyn VideoProbe System is different from fiber optic probes. Take special care to read and understand these instructions thoroughly before performing any procedures in order to use your VideoProbe 2000 system to the fullest of its capabilities.

VideoProbe™ 2000
Warranty

VideoProbe Repair Procedure

If a Welch Allyn VideoProbe needs repair, the following steps should be taken:

1. Call the toll free Welch Allyn VideoProbe Service Hotline (800) 338-3663 in New York State or (800) 327-0075 outside New York State.
2. A customer service representative will attempt to troubleshoot and correct the problem by telephone.
3. If the problem cannot be corrected by telephone and the product is still covered by warranty, we will ship to you by Air Express (PREPAID) a container carrying a replacement component to replace the malfunctioning unit. Replacement instruments will be of equal or higher quality than the instruments being replaced.
4. The new component should be removed from its container and inspected for possible shipping damage.
5. Place the malfunctioning component in the container.
6. Place the return airfreight card enclosed with the replacement instrument on the outside of the container and notify the airfreight company that the faulty instrument is ready for pick up and return to Welch Allyn.
7. If covered by Warranty, the replacement unit is yours at no charge.
8. If the product is not covered by Warranty, you will be asked to send the alleged defective product to Welch Allyn. Upon receipt, Welch Allyn will evaluate the extent of the repair and send to you a repair invoice for an authorized signature.

   If a loaner product is requested during the repair cycle, you must provide a purchase order number and/or an authorized signature. If the loaner product is not returned within 10 days after the repaired product is received, you will be invoiced accordingly.

   Shipping charges to and from Welch Allyn are the customer's responsibility.

The provisions stated herein are procedural in nature and shall not be construed to expand the obligations or liabilities of the manufacturer under the stated Warranty.

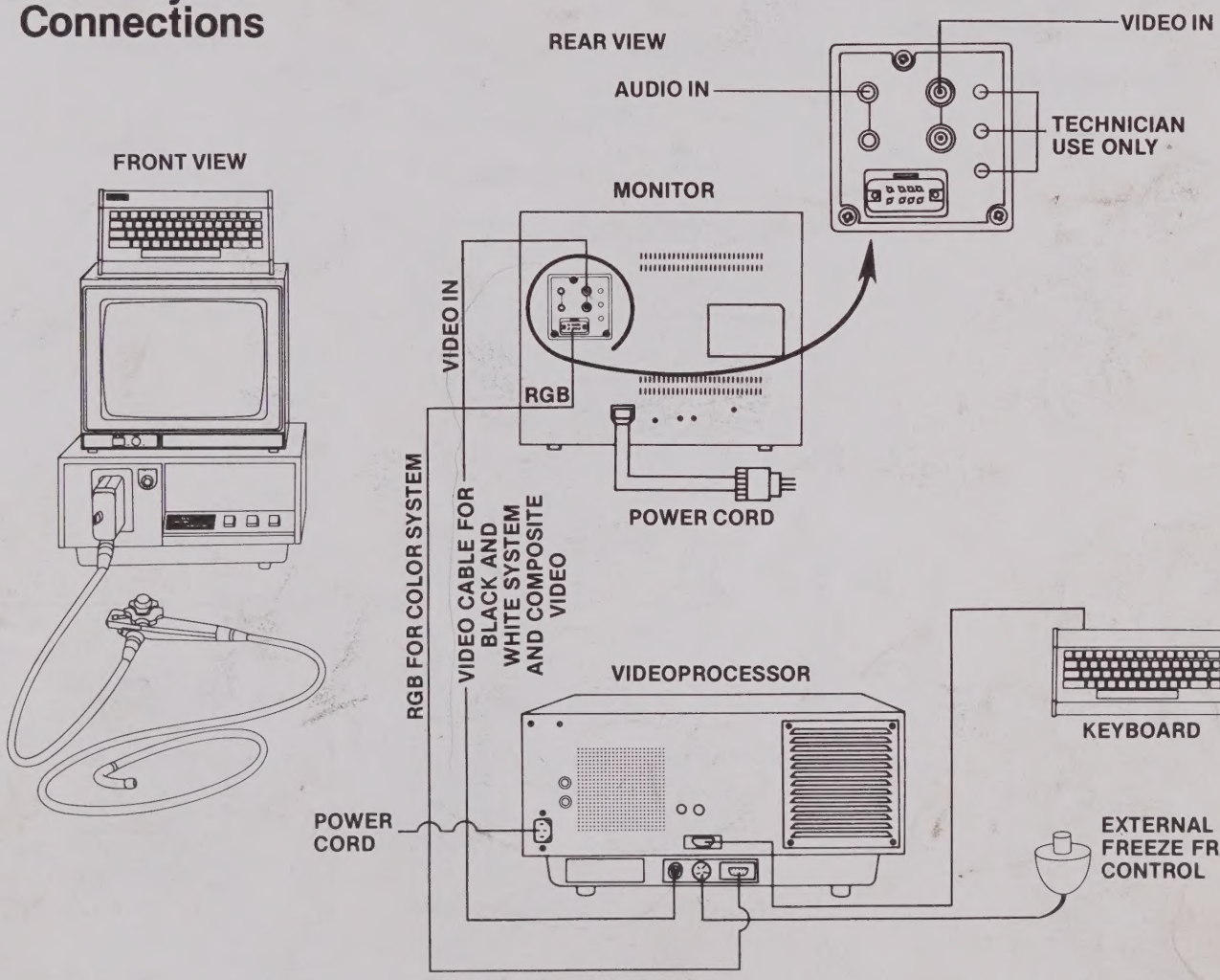
Welch Allyn will make every attempt to assist VideoProbe System customers in obtaining repair services for Video Tape Recorders, instant Cameras, Monitors and Mobile Carts offered for sale by the company, but which are not of its manufacture. For assistance call Welch Allyn's VideoProbe toll free number.

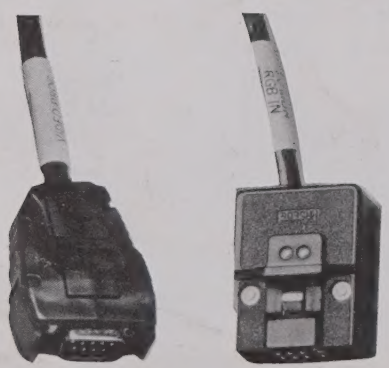
Warranty

Welch Allyn guarantees that VideoProbe System Components of its manufacture are free from defects in materials and workmanship under normal use and service. Welch Allyn's obligation under this Warranty shall be limited to the repair or exchange of any part or parts thereof which may prove to be defective under normal use and service within one year from the date of original purchase and which our examination shall disclose to our satisfaction to be defective. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON OUR PART, AND WE NEITHER ASSUME OR AUTHORIZE ANY OTHER PERSON TO ASSUME FOR US, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THE VIDEOPROBE SYSTEM. This Warranty shall not apply to any product which has been subject to accident, negligence, alteration, abuse, unauthorized repair, improper storage, or other misuse. This Warranty applies only to the original purchaser and cannot be assigned or transferred to any third party. Components excluded under the above are optional Video Tape Recorders, Monitor, Mobile Cart, and Instant Camera Systems which, although manufactured to Welch Allyn specifications, will carry their own warranties which are attached.

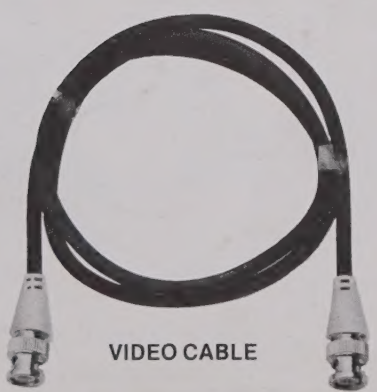
VideoProbe™ 2000
System Set-Up and Inspection

Basic System Connections





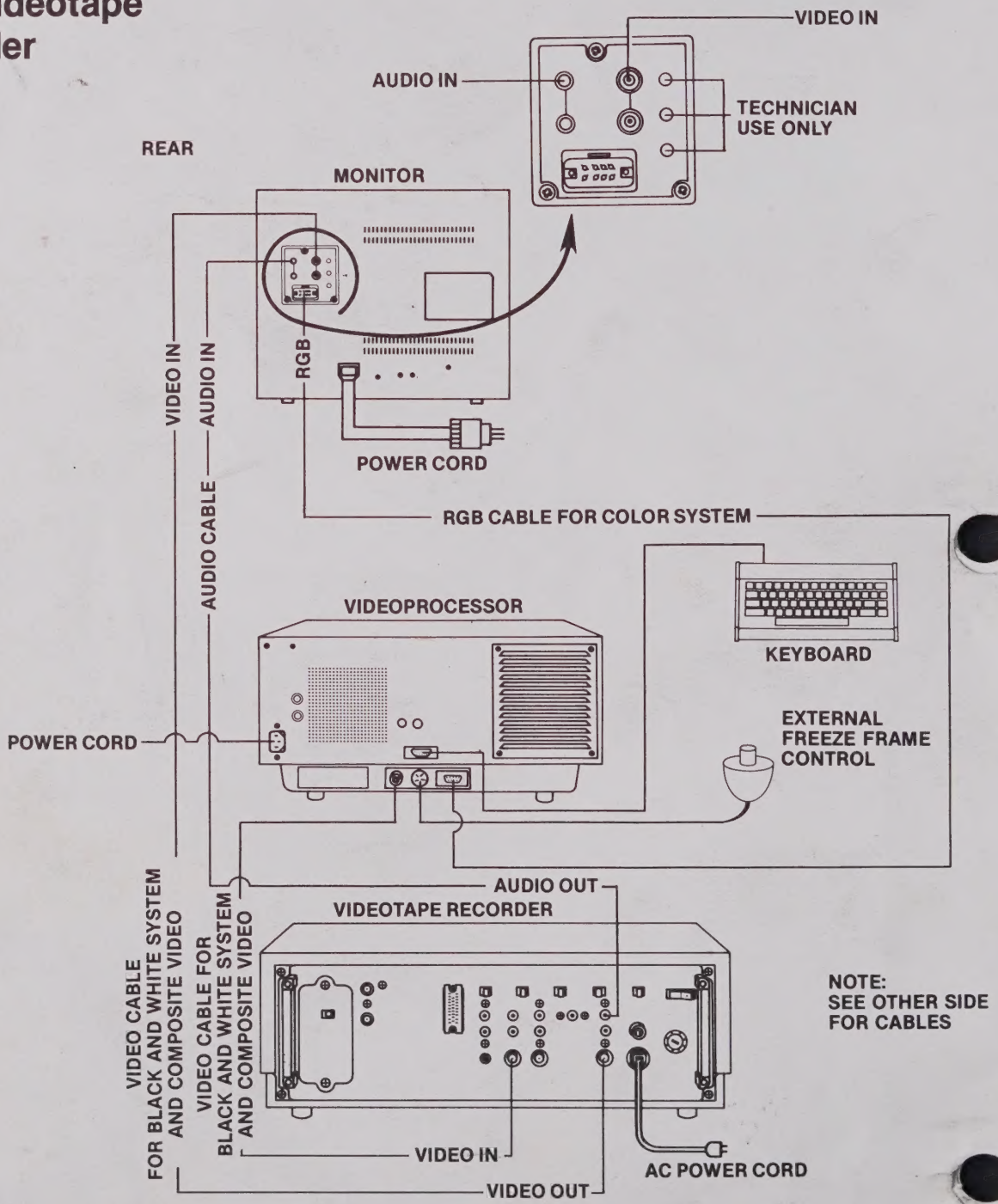
RGB CABLE



VIDEO CABLE

AUDIO CABLE

System Connections with Videotape Recorder



VideoProbe™ 2000

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Components - Nomenclature

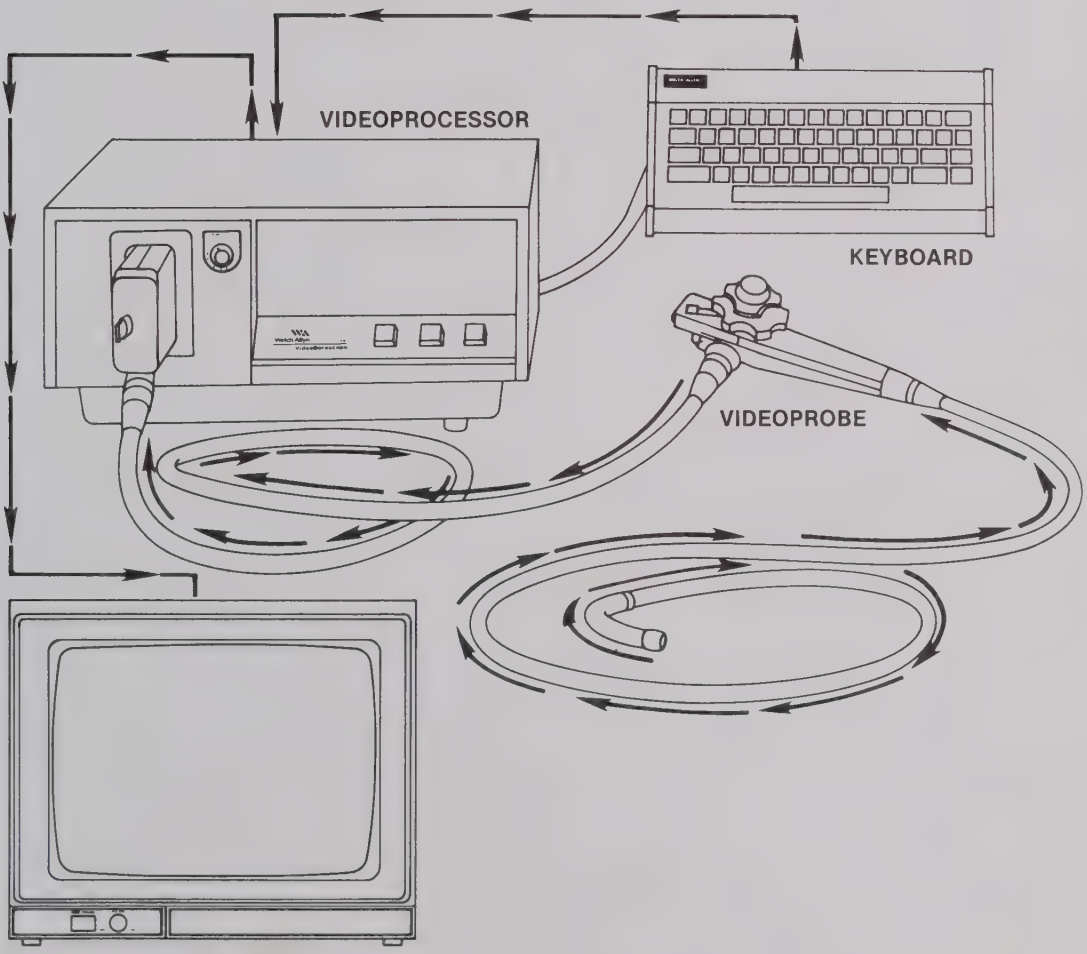
VideoProbe™ 2000
Components—Nomenclature

System

Components

☐VideoProbe
☐VideoProcessor
☐Monitor
☐Character Generator Keyboard

Image flows electronically through VideoProbe to VideoProcessor where it is transformed and sent to Monitor for display. Character Generator Keyboard enters information on Monitor through VideoProcessor.



VideoProbe™ 2000
Components—Nomenclature

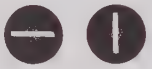
VideoProbes

Components

VideoProbe Service Accessories

The following accessories are included with each VideoProbe:

Lens Guard (used only on some models)



Working Channel Seals

Working Channel Port Assembly

ANTI-FOG SOLUTION
DIRECTIONS APPLY ONE OR TWO DROPS TO LENS AFTER EACH USE.
CAUTION ! FLAMMABLE. KEEP AWAY FROM FIRE OR FLAME. CONTAINS ISOPROPYL ALCOHOL - NOT FOR INGESTION ! KEEP OUT OF REACH OF CHILDREN.
PART NO - H1420
Welch Allyn

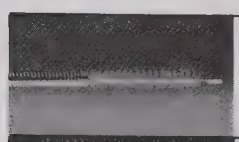
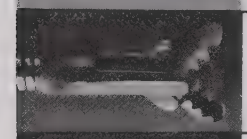
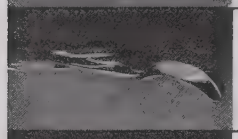
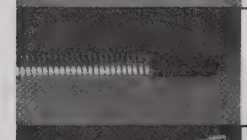
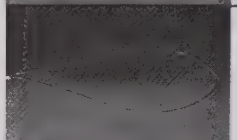
Lens Cleaning Solution

50% of actual size.

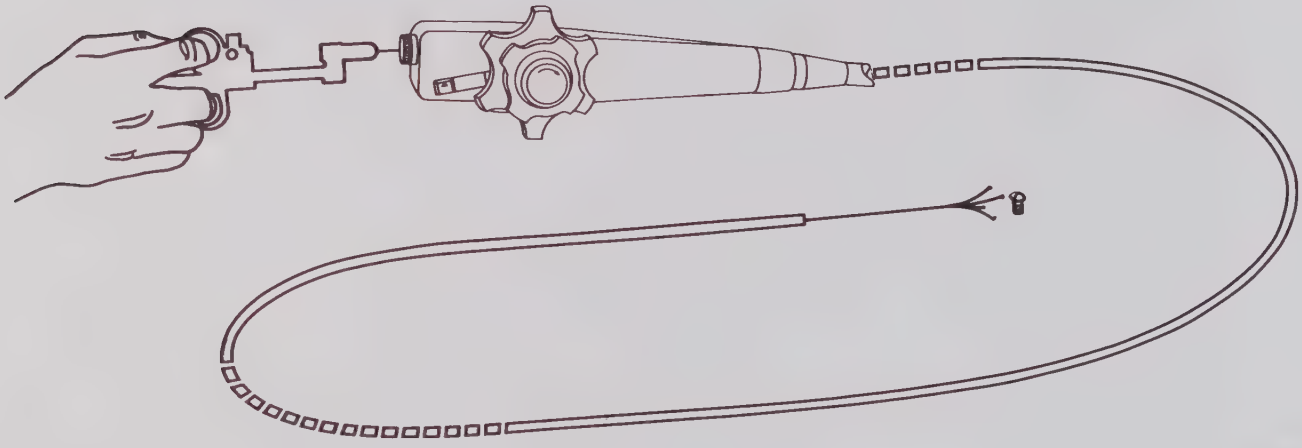
All accessories on this page are actual size.

VideoProbe™ 2000
Components—Nomenclature

VideoProbes
(Continued)

	Special Tools and Description
	**Cleaning Brush** Should there be a need to clear away debris or dust from the area to be inspected, this accessory may be passed through the channel to prepare the area for inspection.
	**Crocodile Forceps** This tool may be used when retrieval of loose nuts, bolts, screws, etc. is necessary.
	Retrieval Basket This tool may be used when retrieval of loose nuts, bolts, screws, etc. is necessary.
	**Scraper** This accessory may be used for scraping away corrosion from the inspection area.
	**Magnet** Magnetic objects such as screws, nuts, bolts, etc. which may have fallen into the inspection area may be retrieved using this accessory.
	Four-Prong Retriever This tool may be used when retrieval of loose nuts, bolts, screws, etc. is necessary.
	**Snare** Accessory to be used when removal of a large foreign object is necessary.
	Teflon Tube Used for irrigation or dye penetrants. No fluids should enter the working channel unless the teflon tube is inserted first. All fluids should be injected through this teflon tubing to avoid unnecessary repairs to the VideoProbe.

VideoProbes
(Continued)



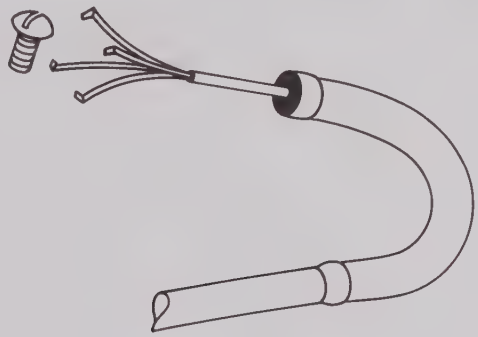
Procedure for Retrieval of Foreign Objects
(For Probes equipped with working channels.)

- Choose the correct accessory for the object to be retrieved. Consideration should include the size and weight of the object and the diameter of the tool and the working channel. (Channel dimensions are noted in model specifications.)
- Check the accessory tool to be sure that it is operating properly before insertion into the working channel. SEVERE DAMAGE TO THE CHANNEL AS WELL AS OTHER COMPONENTS OF DELICATE INSERTION TUBE MAY OCCUR AS A RESULT OF PASSING BROKEN ACCESSORIES OR SHARP WIRES THROUGH THE WORKING CHANNEL!

CAUTION: It is important NOT to pass the tool through the working channel while the bending section is angulated. If angulation is necessary to reach the target, pass the tool through the channel before the Probe is inserted for retrieval. THE WORKING PORTION OF THE TOOL MUST BE IN THE CLOSED POSITION WHILE PASSING THROUGH THE CHANNEL. DO NOT ATTEMPT TO OPERATE THE TOOL UNTIL IT HAS CLEARED THE DISTAL TIP OF THE PROBE (see next page).

VideoProbes
(Continued)

- Maneuver the Probe to the target area and "seize" the object to be retrieved.
- To remove the object from the inspection area, pull it up to the distal tip of the Probe and remove *both* the scope and the retrieved object *while* it is being held by the tool.



Nomenclature (See Figure Following Page)

Probe Connector Terminal

Connects VideoProbe to VideoProcessor.

1. **Electronic Connector**—meshes electrical components of any VideoProbe to VideoProcessor's circuitry for imaging.
2. **Terminal Light Guide**—couples VideoProcessor's lamp to VideoProbe's fiber optic light guides.
3. **Connector Lock Knob**—secures VIDEOPROBE CONNECTOR TERMINAL to VideoProcessor.

CAUTION: CONNECTOR LOCK KNOB should be finger tight. Do not overtighten. Damage to ELECTRONIC CONNECTORS, or TERMINAL LIGHT GUIDE may result.

Umbilical Cord

Connects VIDEOPROBE CONNECTOR TERMINAL and CONTROL SECTION. Contains light guide, and wires over which information from electronic sensor passes.

CAUTION: Care should be taken not to twist, coil or bend cord excessively. Damage to internal components may result. Observe minimum bend radius (pg. 7-3).

Control Section

Contains steering and working channel port.

4. Working channel allows insertion of forceps, snare, and other optional tools.

VideoProbes
(Continued)

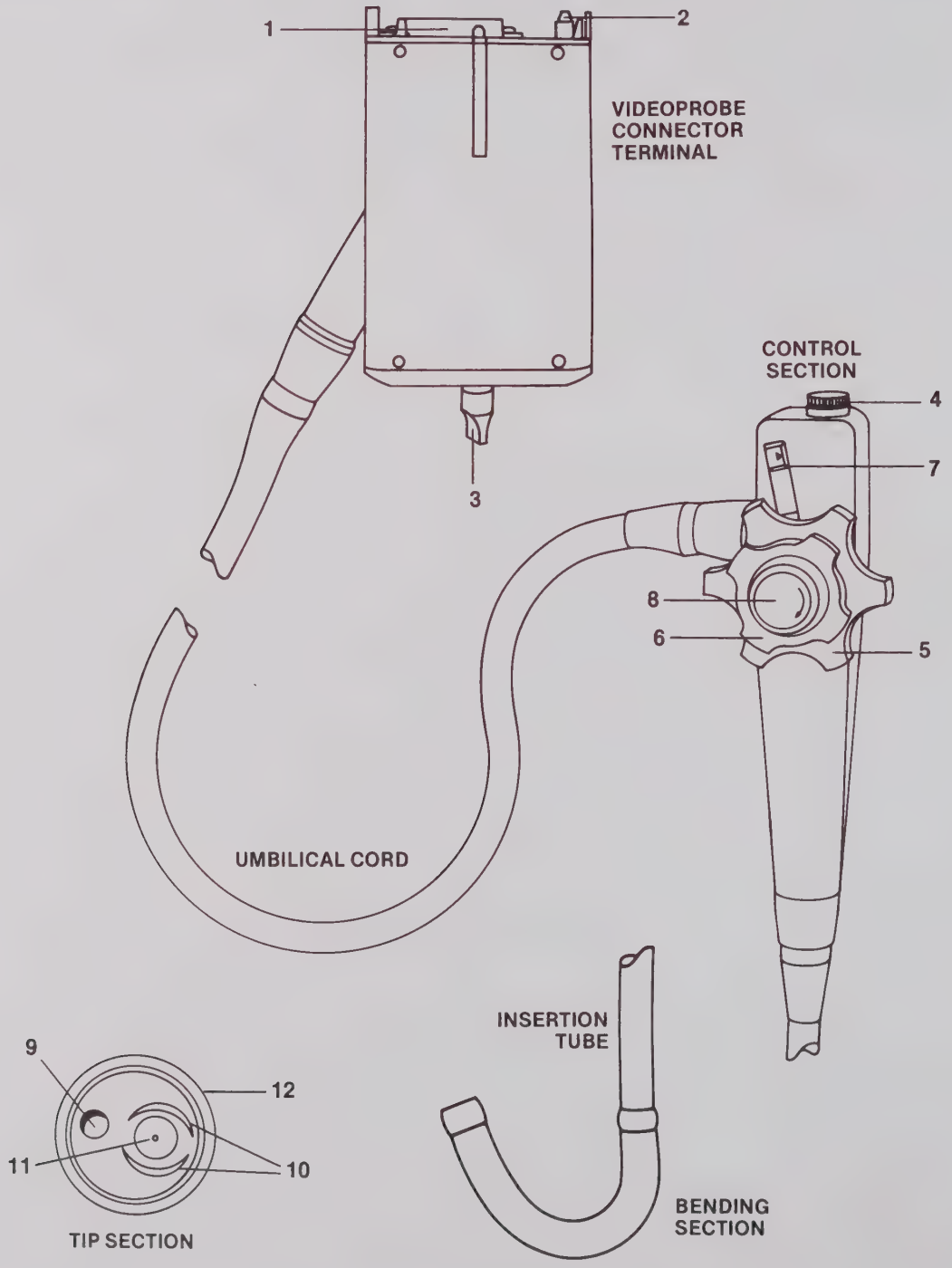


Figure 1
(VideoProbe)

VideoProbes
(Continued)

5. **Steering Deflection Knob (Up-Down)**—allows manipulation of BENDING SECTION of scope in upward or downward direction.

WARNING: Release all tension on knobs if tip resistance is felt. If not, instrument damage may result. Control knobs should be turned slowly for best tip control and to prolong instrument life.

6. **Steering Deflection Knob (Right-Left)**—allows manipulation of BENDING SECTION of scope in right or left direction.

NOTE: See warning in (5), above.

7. **Up-Down Steering Deflection Brake**—used in "on" position to hold up-down steering in desired position. Used in "off" position to allow BENDING SECTION to move freely in up-down plane.
8. **Right-Left Steering Deflection Brake**—used in "on" position to hold right-left steering in desired position. Used in "off" position to allow BENDING SECTION to move freely in right-left plane.

CAUTION: Do not twist, coil or bend INSERTION TUBE EXCESSIVELY. Handling characteristics may be adversely affected, or internal components damaged. Observe minimum bend radius (pg. 7-3) .

Bending Section

CAUTION: Do not bend or twist bending section by hand—damage to instrument may result.

Tip Section

Contains light guides, tool exit port, distal hood, and objective lens and sensor.

CAUTION: Do not strike or drop TIP SECTION against hard surface. Damage may result.

9. **Working Channel Port**—Outlet tool accessories inserted through WORKING CHANNEL PORT.
10. **Distal Light Guides**—provides illumination of area to be examined.
11. **Objective Lens and Sensor**—captures and transmits image signal via wires to VideoProcessor.
12. **Lens Guard**—Provide protection for lenses.

VideoProbe™ 2000
Components—Nomenclature

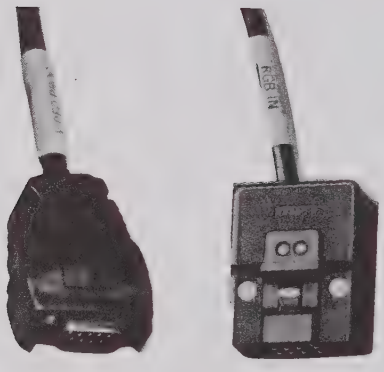
VideoProcessor

Components

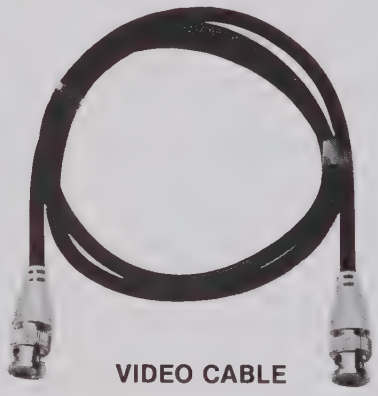
Included with VideoProcessor are the following components:

—VideoProcessor Power Cord
—VideoProcessor to Monitor RGB Video Cable (10 ft.)
—VideoProcessor to Monitor Composite Cable (3 ft.)

NOTE: The ends of multi-strand VideoProcessor to Monitor Cable are individually labelled for easy identification (see interconnections).



RGB CABLE



VIDEO CABLE

Nomenclature (See Figure 2)

Front View

1. **On/Off Switch**—activates VideoProcessor's imaging circuitry and Character Generator (if connected). Performs three functions: 1. With switch on and VideoProbe seated

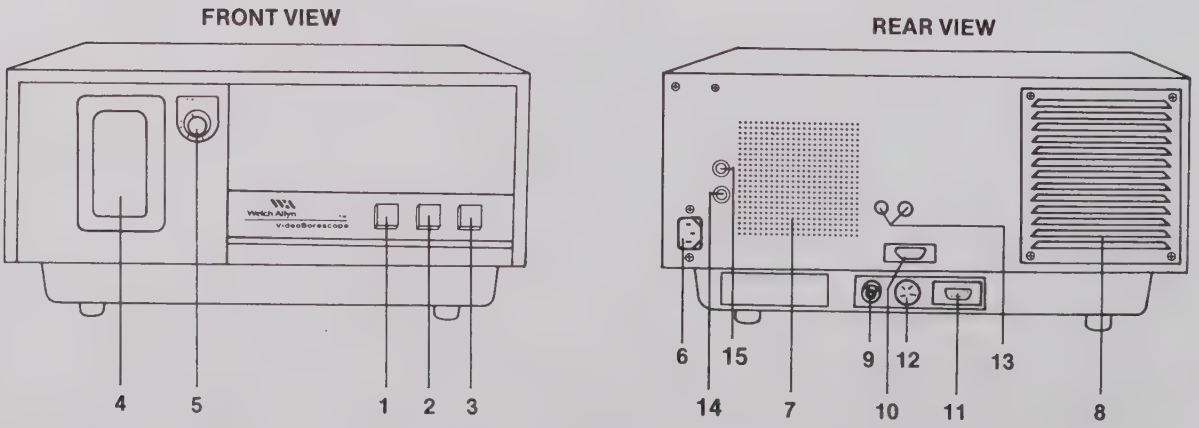


Figure 2

VideoProcessor
(Continued)

in VIDEOPROBE TERMINAL PORT, black and white image appears on Monitor. 2. With switch on and VideoProbe removed from VIDEOPROBE TERMINAL PORT, color bar pattern appears on Monitor. 3. With switch on and Character Generator connected, date, time and Welch Allyn logo appears on Monitor.

2. **Light Switch**—activates VideoProcessor lamp to produce color image on Monitor.
3. **Freeze Frame Switch**—"freezes" image on Monitor for close study or photography. To return to live action, depress switch again.

WARNING: Scope should be advanced or removed only when this switch is off. Changing scopes' position without live image on Monitor may cause damage to instrument.

4. **Terminal Port**—VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6) seat here.
5. **Light Pulse Switch**—controls the number of strobe pulses per TV field (for application see section 4-1 on Special Features).

CAUTION: Make sure VideoProcessor is off when not in use and before VideoProbe is connected. Do not insert any instrument or object that is not a Welch Allyn VideoProbe into this port. Doing so may damage VideoProcessor or injure operator.

VideoProcessor must be turned off when VideoProbe is not seated in VIDEOPROBE TERMINAL PORT. This precaution is necessary to insure that operators do not come into contact with exposed connector pins within VIDEOPROBE TERMINAL PORT.

Rear View

6. **Power Cord Receptacle**—couples VideoProcessor Power Cord to VideoProcessor.
7. **& 8. Air Exhaust and Intake**—cool VideoProcessor.

CAUTION: Make sure AIR EXHAUST AND INTAKE are no closer than three inches to any wall, cabinet, etc. to allow adequate ventilation and prevent overheating. Do not allow filter on air intake to become dirty.

9. **Video Output Jack**—couples BNC type composite video cable to VideoProcessor.
10. **Character Generator Terminal**—couples Character Generator Keyboard to VideoProcessor.
11. **R.G.B. Terminal**—couples RGB "Out" cable to VideoProcessor.
12. **Freeze Frame Switch Connector**—couples accessory freeze frame switch to the VideoProcessor.
13. **Color Balance Controls**—factory preset color adjustments. These should only be adjusted by qualified technical personnel with the proper equipment and are not user serviceable.
14. **Illumination Gate**—BNC connector for external light source (see Special Features section for applications).
15. **Lt. Trig. Pulses**—BNC connector for external light source (see Special Features section for application).

VideoProbe™ 2000
Components—Nomenclature

Monitor

Components

—13" Color Monitor

Nomenclature (See Figure 3)

Front View

1. **Screen**—displays video image and data from Character Generator Keyboard (when attached).

NOTE: Wipe screen clean of dust and smudges regularly, using commercial glass cleaner. This assures clear images.

2. **Power Switch**—push to turn the monitor on. The power indicator will illuminate. Push again to turn the monitor Off/Stand By.
3. **Volume Control**—A. Push to release the knob. B. Adjust this control for the desired audio level (should be turned off except during Videotape playback). C. Push again to conceal the knob.

IMPORTANT NOTE: The following controls (4-10) should not be used unless advised by Welch Allyn service personnel.

4. **Contrast**—controls contrast as on standard television monitor. Clockwise rotation increases intensity of white portion of picture—increasing contrast.

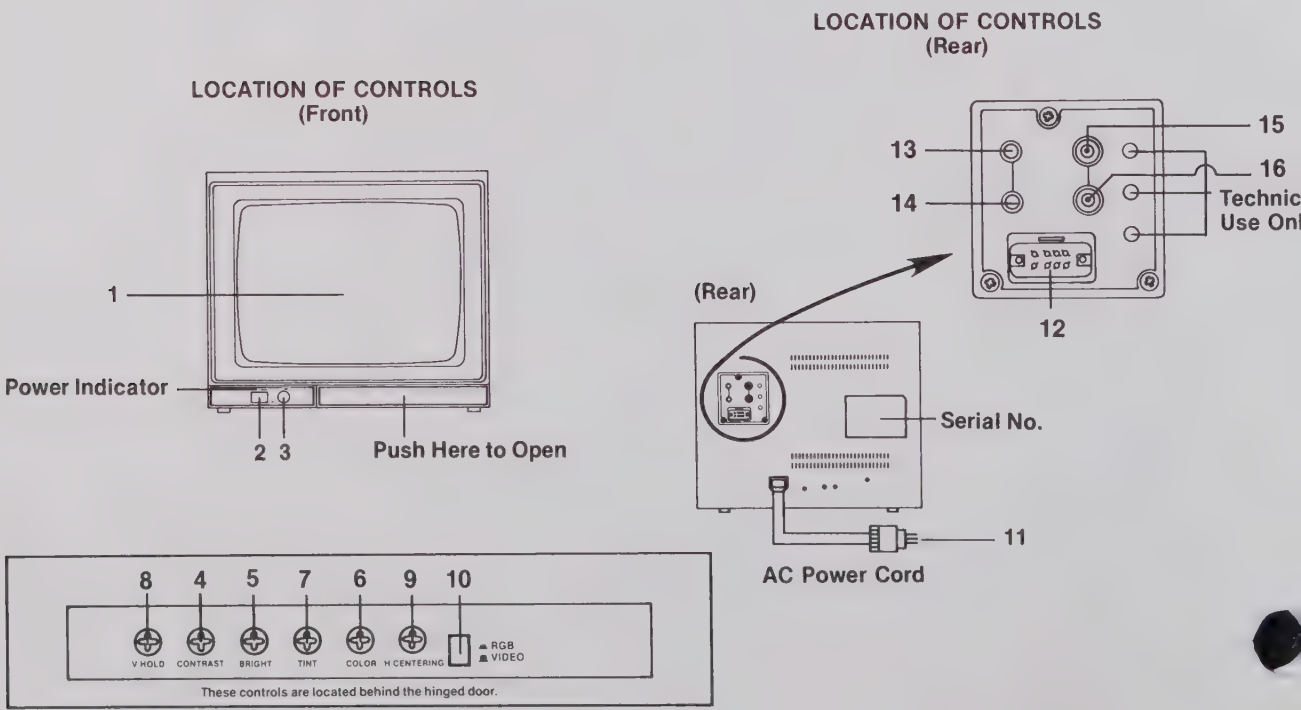


Figure 3

Monitor
(Continued)

5. **Brightness**—controls brightness as on standard television monitor. Clockwise rotation increases brightness of dark areas of picture. Counterclockwise rotation darkens light areas of picture. Extreme clockwise rotation causes image to appear washed out. Extreme counterclockwise rotation decreases detail in dark areas of picture.
6. **Color**—(Video mode only)—controls richness of color on screen. Clockwise rotation increases color; counter-clockwise rotation decreases color. (Does not function in RGB mode).
7. **Tint**—(Video mode only)—controls relative hue of various colors in picture. Clockwise rotation decreases green hue. (Does not function in RGB mode).
8. **V-Hold**—adjust if the picture rolls up or down or if the characters appear to jitter.
9. **H-Centering**—adjust to center the picture from left to right on the screen.
10. **RGB/Video Selector Switch**—

    RGB: Select RGB for normal use.

    Video: Select video for videotape review only.

CAUTION: Do not place anything on top of Monitor. Spilled liquids can be hazardous and damage Monitor.

Rear View

11. **AC Power Source**—plugs into 110-130VAC-60Hz, 3-prong outlet.
12. **RGB in Terminal**—couples RGB cable from VideoProcessor to Monitor.

CAUTION: RGB Cable Connector must be properly oriented before connecting with terminal. Do not force! Improper alignment may result in broken connectors or pins, damaging System.

13. **Audio In Terminal**—couples Audio Cable from optional videotape recorder to Monitor.
14. **Audio Out Terminal**—not used in normal system function.
15. **Video In Terminal**—couples Composite Video Cable from VideoProcessor to Monitor or couples Composite Video Cable from optional Videotape recorder to Monitor.
16. **Video Out Terminal**—not used in normal system function.

NOTE: The Video Out Terminal has a 75 OHM "automatic termination" switch. The 75 OHM termination is automatically disconnected when a cable is connected to the VIDEO OUT CONNECTOR to "loop-through" to other video equipment.

Accessories

Components

—Mobile Cart
—Videotape Recorder
—Camera and Hood

Nomenclature (See Figure 5)

Mobile Cart

Used to contain System. Has capacity to carry Video-Processor, VideoProbe, Monitor, Character Generator Keyboard and VTR. Complete instructions and nomenclature included with cart.

Camera and Hood

Instant CRT Photographic System to take images off VideoProbe Monitor. Hood can be adapted for 35mm photography. Complete setup and use instructions included with camera system.

VTR

The Welch Allyn VideoProbe can be used with any standard Videotape Recorder.

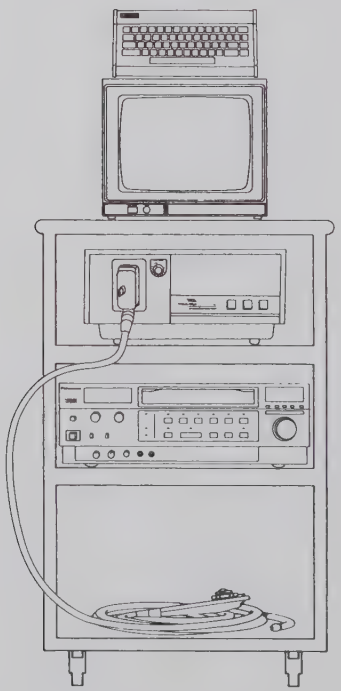


Figure 5

System Set-Up And Inspection

VideoProbe™ 2000
System Set-Up and Inspection

System Set-Up

The room where the VideoProbe System is used should be laid out so that the Monitor is in best position for easy viewing. In most instances, Monitor should be placed on a shelf or countertop, at or near eye level. For best resolution, screen should be viewed at a distance of 3½ to 5 feet.

The VideoProcessor and VideoProbe should be placed on a countertop or Mobile Cart.

Electrically powered components (VideoProcessor, Monitor) should be positioned in close proximity to a 110-130VAC-60Hz, 3-prong, I5A outlet.

CAUTION: Care should be taken to locate components in such a way that connecting Video Cables and Power Cords will not obstruct movement.

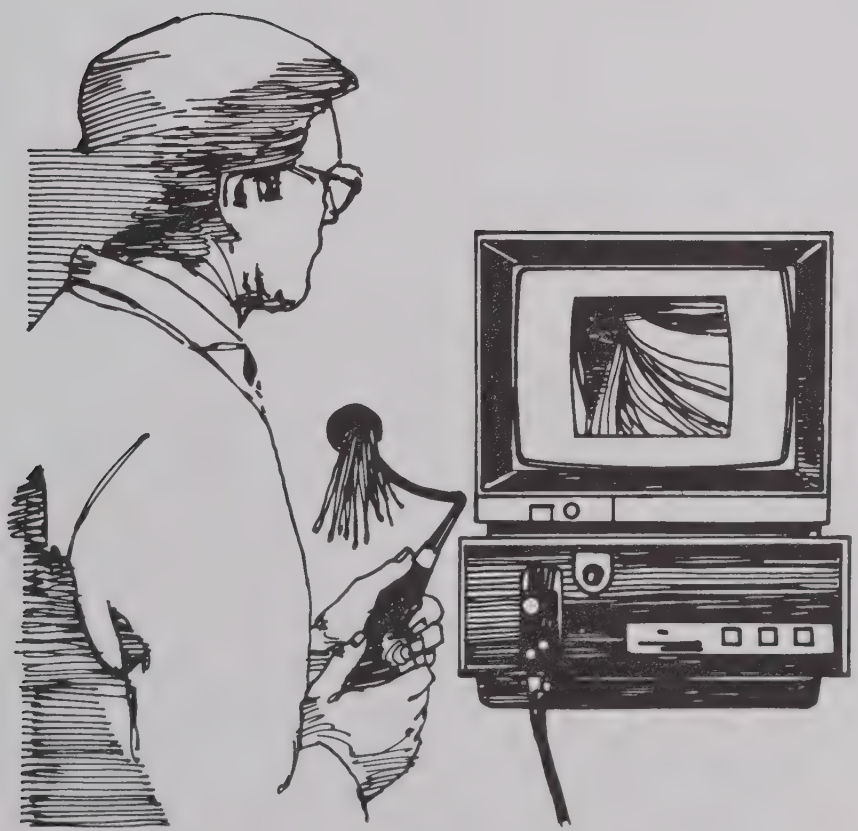


Figure 6

VideoProbe™ 2000
System Set-Up and Inspection

Physical Set-Up & Power

- Carefully unpack VideoProbe components and inspect for obvious damage. Notify Welch Allyn immediately if instruments have been damaged in shipment or are missing.

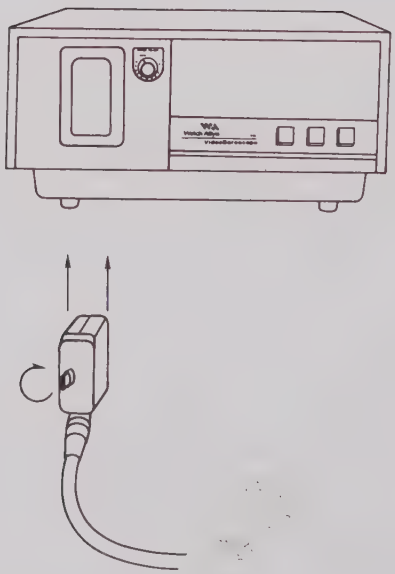
CAUTION: Position VideoProcessor in Mobile Cart or on countertop leaving at least 3 inches clearance behind VideoProcessor cabinet to facilitate air flow. Failure to do so may result in instrument malfunction and/or damage.

- **Plug VideoProcessor and Monitor into 110-130VAC-60Hz, 3-prong, 15A outlet.**

Interconnections

When dealing with sight and sound, it is easiest to follow interconnections between components by following image and audio from their sources to display, (i.e., VideoProbe—VideoProcessor—videotape recorder (if used)—Monitor).

CAUTION: Make sure VideoProcessor is off when not in use and before VideoProbe is connected. Do not insert any instrument or object that is not a Welch Allyn VideoProbe into this port. Doing so may damage VideoProcessor or injure operator.



Picture (Image)

VideoProbe to VideoProcessor

1. Seat VIDEOPROBE CONNECTOR TERMINAL in VIDEOPROBE TERMINAL PORT of VideoProcessor. Rotate CONNECTOR LOCK KNOB clockwise until snug—DO NOT OVERTIGHTEN (Figure 7)!
2. Power cord from VideoProcessor should be plugged into 110-130VAC-60Hz, 3-prong, 15A outlet.

WARNING: If Probe hanger is not available, VideoProbe should be positioned so it will not drop.

Figure 7

Inspection

Components should be inspected before each procedure. Malfunctioning or damaged components should not be used. (Refer to Troubleshooting Section, pg. 6-1).

Visual VideoProbe Inspection

Insertion Tube (if articulating)

Inspect INSERTION TUBE (pg. 1-6) for tears, cuts, dents, bumps, or any other alteration in smooth appearance. (Verify visual inspection by touch).

Bending Section (if articulating)

Inspect BENDING SECTION (pg. 1-6) for irregularities as with INSERTION TUBE above. Rotate both STEERING DEFLECTION KNOBS (pg. 1-6) slowly in all directions to verify that bending mechanism is operating smoothly. If grating, friction, or resistance is felt, do not use VideoProbe. Apply and release STEERING DEFLECTION BRAKES (pg. 1-6) to verify that BENDING SECTION locks and releases.

Working Channel

Verify that working channel is clear by passing appropriate size tool. If tool does not pass easily, do not force. (Refer to Troubleshooting Section, *VideoProbe—Unable to Pass Tools,* pg. 6-1).

Tip

Be sure that LENS GUARD (pg. 1-2) (if used) is secured to tip.

Operational VideoProbe, VideoProcessor Inspection

Depress VIDEO and LAMP SWITCHES (pg. 1-8,9) of VideoProcessor to turn System on. Hold VideoProbe INSERTION TUBE (pg. 1-6) with right hand, and CONTROL SECTION (pg. 1-6) with left hand.

Operational Character Generator and Monitor Inspection

Monitor Image

Turn Monitor on. After short warm up, black and white image should appear on Monitor screen (when VideoProbe is seated in VideoProcessor). Moving tip of VideoProbe close to colored object (hand), image viewed on Monitor should correspond to object under direct vision.

CAUTION: If color does not appear to be correct, do not proceed with use. Allow VideoProcessor ample time to warm up. If color is still not true, call Welch Allyn Service Hotline.

NOTE: Inspections should be conducted with RGB/VIDEO SWITCH (pg. 1-11) on front of Monitor in RGB position for truest color.

Inspection
(Continued)

Character Generator Image

With Monitor on, Welch Allyn logo, date, time, and information from previous inspection should appear. (If not, refer to Troubleshooting Section, *Other Specific Problems—Character Generator Keyboard Information Not in Right Location,* pg. 6-25).

VideoProbe Light Guides

Inspect TIP SECTION (pg. 1-6) to verify that lamp is functioning properly. Inspect DISTAL LIGHT GUIDES (pg. 1-7). Illumination should be bright and lamp in VideoProcessor should strobe on and off. (If not, refer to Troubleshooting Section, *VideoProbe—No Light From Light Guides,* pg. 6-1).

Character Generator

VideoProbe™ 2000
Character Generator Operation

Character Generator Keyboard

Components

Character Generator Keyboard

Nomenclature (See Figure 4)

Character Generator Keyboard adds documentation capability to VideoProbe System. Coupled to VideoProcessor's imaging circuits, it allows user information to be displayed on Monitor.

Character Generator

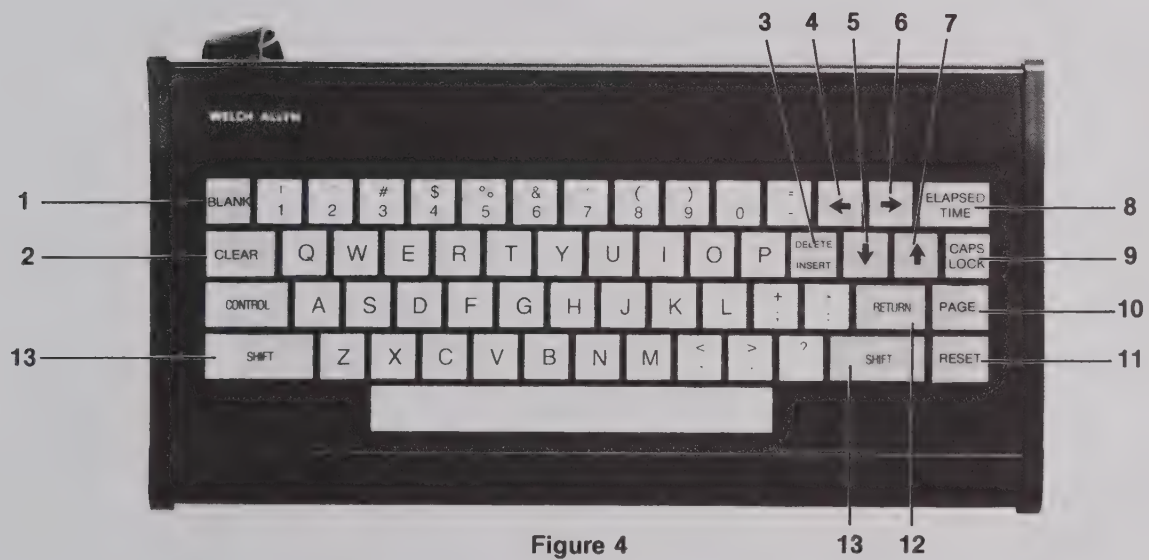


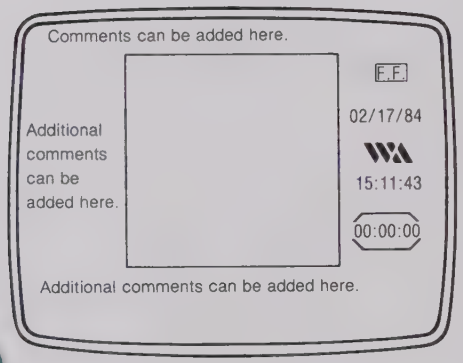
Figure 4

Character Generator Keyboard
(Continued)

Keys

1. **Blank**—depressing this key blanks all information from page 1 except the Welch Allyn logo and the Freeze Frame symbol. Pressing this key again restores all information. This key has no effect on pages 2 and 3.
2. **Clear**—performs two functions: 1. When cursor is in an individual field, depressing key will clear all entries in that field. 2. Holding down page while pressing clears all information entered on that page except time, elapsed time, and date when cursor is not visible.
3. **Delete/Insert**—depressing key allows deletion or insertion of a letter mid-word or mid-sentence. Automatically inserts a space or deletes a character previously entered (once cursor is positioned under character) to make room for correct character insertion. Shift key must be held to delete.
4. **Left Arrow**—moves cursor on screen one space left.
5. **Down Arrow**—moves cursor on screen one space down. Hold down Page key and depress Down Arrow key to switch micro processor to next page.
6. **Up Arrow**—moves cursor on screen one space up. Hold down page key and depress up arrow key to switch micro processor to next page.
7. **Right arrow**—moves cursor on screen one space to right.
8. **Elapsed Time**—depressing key starts elapsed time clock. To reset elapsed time clock, depress key again, to remove elapsed time depress reset.
9. **Caps Lock**—depress key while holding down shift key to shift microprocessor to upper case letters and symbols (with exception of symbols, above numbers). Depressing key again will cancel function.
10. **Page**—performs two functions: 1. Hold down page key and depress up or down arrow keys to shift microprocessor to corresponding page. 2. Hold down page key and depress clear key to clear all information in memory with exception of date, time, and elapsed time.
11. **Reset**—depressing this key resets microprocessor. Used upon start up of VideoProcessor if information on Monitor is not in correct location, or if miscellaneous characters are in areas where no characters should be. This key also removes the elapsed time.
12. **Return**—moves cursor to next field.
13. **Shift**—switches all characters to upper case. Must be held down while typing character (unless Caps Lock is engaged). This key also causes accelerated movement of the cursor when used with the arrow keys. i.e.: Shift-right arrow moves arrow all the way to the right.

Character Generator Keyboard
(Continued)



Entering Information

With Character Generator Keyboard connected to VideoProcessor, and video switch on, page 1 will be displayed on monitor. Depress reset key before entering any information. Welch Allyn logo, date, and time will be displayed.

NOTE: When using reset key, freeze frame switch should be in the off position.

To begin input on page 1, depress down arrow key. A cursor (an underline which flashes at the point where information will be put) will appear. Information can be entered in three places.
1. on line 1 (38 characters or spaces) at top of page (above image). 2. 3 Fields, 3 lines per field, (8 characters of spaces per line) at left of page (beside image), and 3. 2 Lines (38 characters or spaces per line) at bottom of page (below image).

Cursor can be moved down on the page by depressing the down arrow key, or up on the page by depressing the up arrow key.

Information can be typed only where cursor appears.

To delete a complete line of text, move cursor to line to be removed and depress clear key.

NOTE: Clear key removes complete field on left margin entries.

To delete a complete page of text, depress page key while depressing clear key. Logo, date, and time will remain.

NOTE: Cursor must be visible for this function.

Cursor can be removed by depressing up/down arrow key until cursor moves off page.

To delete or insert a character or space, use directional arrows to move cursor under the mistake.

To insert, depress delete/insert key. This will automatically enter a space. To delete, hold down shift key while depressing delete/insert key. This will automatically delete character. Then depress insert key to enter space. To insert correct character, depress appropriate key.

To enter all capital letters, hold down Shift key and depress Caps Lock key. To return to lower case, depress Caps Lock key again.

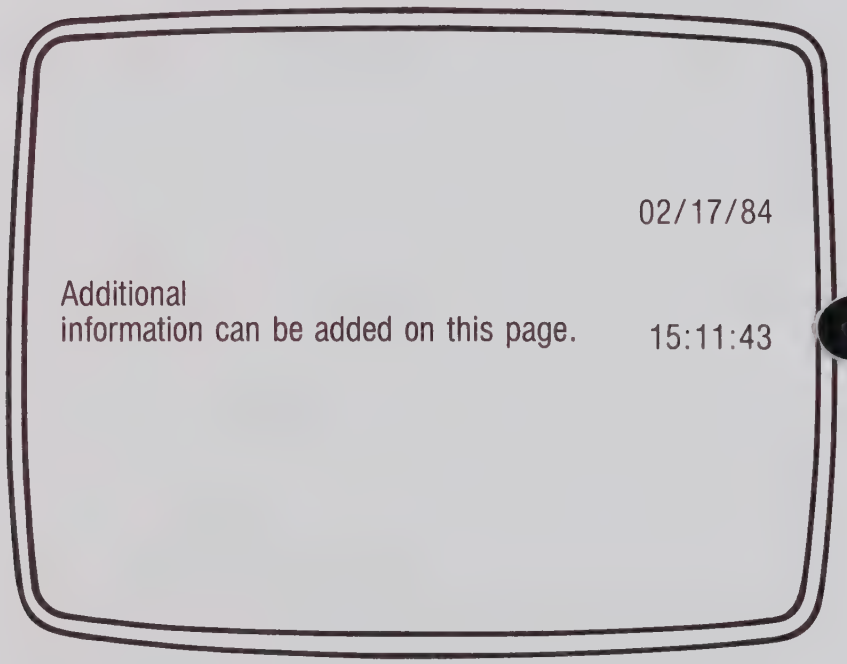
Character Generator Keyboard
(continued)

Page #2—Information Input

To move to page 2 from page 1, hold down page key and depress down arrow key. Data from page 1 top line and from left margin will appear. Date and clock will appear in upper right quadrant.

To begin input depress down arrow key. The cursor will appear one third of the way down the page.

There are now 11 lines (38 characters or spaces per line) available to enter information.



Character Generator Keyboard
(continued)

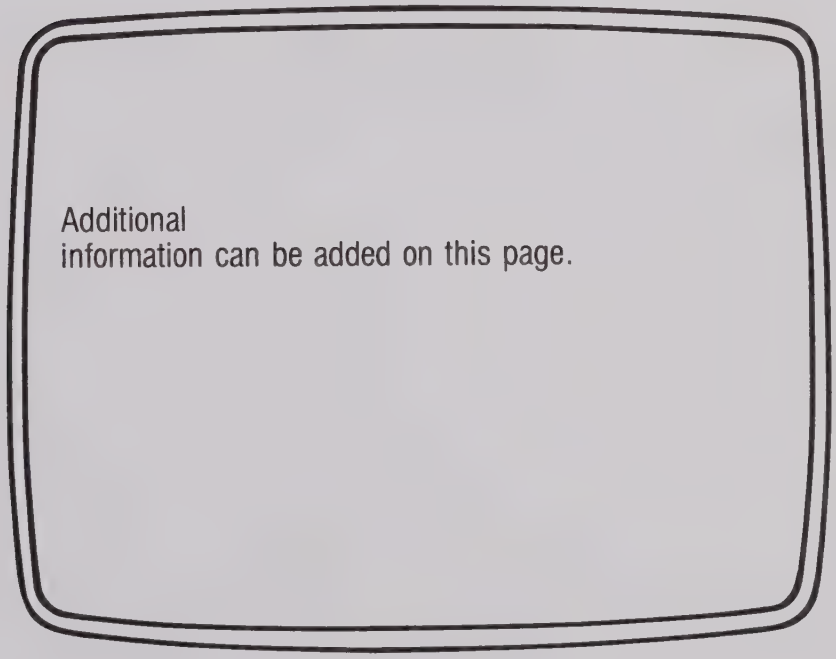
Page #3

To move to page 3 from page 2, hold down page key and depress down arrow key.

Information on page 1, line 1, will be displayed at top of page 3.

Remainder of this screen is a field used to input any other information—depress down arrow key to move cursor to start of field. Up to 15 lines of information (38 characters or spaces per line) can be entered.

Return to page 1 by holding down page key and depressing down arrow.



Character Generator Keyboard
(Continued)

To temporarily blank all information from screen for confidentiality press down blank key. To display information again, repeat procedure (functions only on Page 1 with cursor not visible).

To time length of procedure, depress elapsed time key. This automatically starts a running clock which is displayed in right margin of screen. It can be reset at zero at any time by depressing elapsed time key again. Clock continues to run internally when freeze frame switch is engaged. Turn off freeze frame switch to view elapsed time. To restart at 00:00:00 depress elapsed time key again. To remove elapsed time clock, depress reset key.

Clock and Calender

Actual time and date will change automatically even with VideoProcessor off and Character Generator Keyboard disconnected.

The "/" and ":" symbols are not typed when entering time and date. They are entered automatically. Time should be entered using a 24 hour clock, to the nearest minute (e.g. 2PM would be entered as 14:00:00).

To change date and clock, view page 1 on monitor. Move cursor to top of page. Depress down arrow once. Depress right arrow eight times. Cursor should now appear under first digit of date. Enter new date. Depress return key.

If date does not need to be changed depress down arrow once. Cursor should now appear under first digit of clock. Enter new time. Depress return key.

NOTE: It is important to depress return key to enter new date and time in memory. Date and clock function will not accept invalid input; i.e. 13/36/85, or 25:73:89.

To view any page, hold down page key and depress up or down arrow key until page desired is viewed.

Information entered on any page will remain on that page, even if the keyboard is disconnected, unless the clear page key is depressed for a complete page removal or clear is depressed for a single line removal.

Special Features

Special Features

Freeze Frame Feature

To "freeze" image on Monitor, depress FREEZE FRAME SWITCH (pg. 1-9) on VideoProcessor. An FF Symbol will appear on Monitor (if Character Generator Keyboard is connected). Depress again to return to live image.

WARNING: VideoProbe should be advanced or removed only when image on Monitor is live and FREEZE FRAME SWITCH (pg. 1-9) is off. Failure to follow this procedure increases risk of harm to VideoProbe or object being viewed.

Remote Freeze Frame Control

1. **Remote Switch**—An accessory switch is available which may be connected to the external freeze frame jack for remote control of freeze frame (on back of VideoProcessor).
2. **Other**—Peripheral equipment (such as a computer) may also be used to control the freeze frame function. Connection may be made to the external freeze frame jack (see Figure 2) on the back of the VideoProcessor by using Amp pins 207437-3, Amp connector 207313-1 and Amp cord guard 207314-1. Consult Welch Allyn for proper pin out connections.

Control of Illumination

1. **Light Pulse Control**—The light pulse switch on the front of the VideoProcessor controls the number of light pulses per TV field (the switch has positions for 0 to 11 pulses per TV field and an automatic setting). In the automatic setting the number of light pulses is automatically varied between four and twelve to provide maximum light without blooming (white smearing in the picture caused by excessive light). Where maximum light is required and blooming can be tolerated, the fixed light settings (1 to 11) should be used.

Special Features
(Continued)

2. **Stop Action Feature**—Black and white VideoProcessors offer a unique stop action capability. The duration of a single light pulse is approximately two microseconds. With the light pulse control switch set at one pulse per TV field, the exposure time for each TV field is only two microseconds. An object moving at 1000 ft/sec will have moved .024 of an inch in this time. Thus the smearing of the "stop action" image is limited to .024". In this example, it can be seen that the single pulse setting of the light pulse switch is highly effective in giving a clear "stop action" image of rapidly moving objects. This can be very useful in applications involving motion analysis.

   When the light pulse control switch is set for more than one light pulse per TV field, each frame will be a multiple exposure with each exposure separated in time by 952 microseconds (the time between the light pulses in a single frame). For stop action to be most effective ambient lighting should be kept to a minimum.

   The "stop action" picture can be frozen on the monitor screen for still photography using the freeze frame capability, or a continuous sequence of frames with two microsecond exposure time spaced 1/60th of a second apart can be recorded on videotape for subsequent analysis on playback. Individual frames of the sequence can be analyzed if the video tape recorder has single frame capability.

External Illumination Synchronization or Drive

Signals are provided at the rear of the VideoProcessor to synchronize and control external light sources when required. These signals are provided from 74LS37 NAND GATE BUFFERS through 75 ohm resistors to the BNC connectors.

1. **Illum. Gate (Illumination Gate) (Black and white VideoProcessor only)**—The signal at this BNC connector should be used to control the "light on" time of an external light source such that the source provides illumination only when this signal is TTL logic level "high". The TTL low level represents the time during which the image signal is being clocked from the imaging device to the VideoProcessor. If illumination is present during this time, it will cause smearing of the picture.

   The time duration of this pulse is varied by the light pulse control switch or the automatic light control (when the light pulse switch is in the "automatic" position). This signal can be used to manually or automatically, through the use of the light pulse control switch, control the amount of illumination provided by a compatible external light source.

   The time duration of this signal per TV field (1/60th of a second) is 952 microseconds x n, where n is the number of light pulses set on the light pulse control switch. In the automatic position the automatic light control circuit varies the pulse duration from 3.8 mS to 11.4 mS as required to eliminate blooming.

Special Features
(Continued)

2. **LT Trig Pulses (Light Trigger Pulses) (Black and white VideoProcessor only)**—The function of this signal is similar to that of the Illum. Gate signal except the illumination gate time has been divided into pulses, as determined by the light pulse control switch setting. The number of pulses per TV field will equal the setting of the light pulse control switch and will be varied from four to twelve automatically by the automatic light control circuit with the light pulse control switch in the automatic position.

   This signal can be used for triggering an external "strobe type" light source. The strobe can be triggered from the positive or negative edges of the pulse signals. In selecting a strobe light source and trigger polarity, it is essential that the actual time that the strobe is fired falls within the illumination gate logic level "high" time to avoid the smearing caused by illuminating while the image signal is being clocked from the imaging device.

Cleaning, Maintenance and Storage

VideoProbe™ 2000
Cleaning, Maintenance and Storage

Cleaning

VideoProbes

VideoProbes should be cleaned immediately after each use. VideoProbes are delicate and will degrade if not cleaned promptly.

- Working channel should be rinsed. TIP SECTION (pg. 1-6) should be immersed in clear water.
- Prepare solution of soapy water to wash VideoProbe.
- Remove LENS GUARD (pg. 1-7) (if attached) and Working Channel Port Assembly (pg. 1-2). Wash both in soapy solution. Rinse with clean water and set aside.
- Wash INSERTION TUBE (pg. 1-6) and BENDING SECTIONS (pg. 1-6) thoroughly. Rinse with clean water, and dry.

NOTE: As you wash and rinse, inspect the INSERTION TUBE (pg. 1-6) and BENDING SECTION (pg. 1-6) for any irregularities.

WARNING: Do not immerse or dampen CONTROL SECTION (pg. 1-6) or VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6) section. To do so will result in damage to VideoProbe.

- Immerse TIP SECTION (pg. 1-6) of VideoProbe into cleaning solution. Insert Welch Allyn VideoProbe Cleaning Brush (pg. 1-3) into working channel (after removing Working Channel Port Assembly, pg 1-2) and thoroughly brush entire channel. Cover channel opening with fingertip and immerse tip of VideoProbe in clear water. Remove TIP SECTION from water to dry channel. Wipe channel opening with cotton-tipped applicator moistened in 70% ethyl alcohol. Repeat procedure with a succession of applicators until those used remain clean.
- Wash, rinse, and dry Working Channel Port Assembly and LENS GUARD (pg. 1-2) thoroughly. Reattach to VideoProbe.
- CONTROL SECTION (pg. 1-6), UMBILICAL CORD (pg. 1-6), and VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6) should be wiped clean using gauze slightly dampened by 70% ethyl alcohol.
- Inspect Cleaning Brush (pg. 1-3) frequently for wear. Brushes with worn or lost bristles should not be used.

VideoProcessor, Monitor and Character Generator Keyboard

VideoProcessor Cabinet, Monitor Cabinet, and Character Generator Keyboard should be wiped clean using gauze slightly moistened with 70% ethyl alcohol.

CAUTION: Do not insert anything into VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6).

Cleaning
(Continued)

- Monitor screen should be cleaned regularly using a commercial glass cleaner or equivalent. Image seen will not be clear if dust and dirt are allowed to accumulate. Photography taking will also be degraded.

CAUTION: Care must be taken not to spill liquids on top of components.

Other Accessories

- Mobile Cart may be cleaned with gauze slightly moistened with 70% ethyl alcohol.
- Tools should be cleaned according to their manufacturers' recommendations.

Maintenance

VideoProcessor

Air Exhaust and Intake (pg. 1-9)

Screens should be inspected at regular intervals to assure they are not clogged with dust or debris.

To clean, remove the four anchoring screws from corners of inlet assembly. Remove screen, clean and replace.

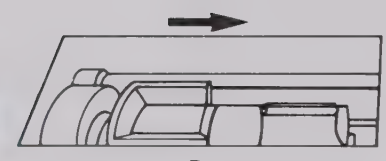
Lamp Replacement

CAUTION: Be sure lamp is cool before attempting to replace.

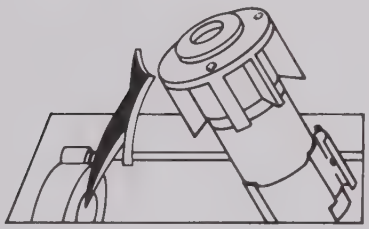
- Remove four Phillips Head screws on side of VideoProcessor. They anchor top cover of VideoProcessor to chassis.

Maintenance
(Continued)

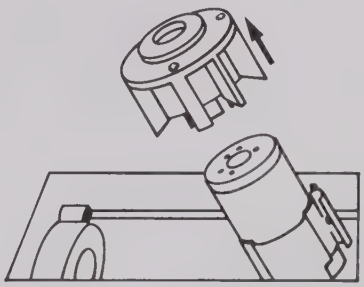
- Lamp assembly is in left front portion of VideoProcessor **(A)**. Reach through opening in protective screen and push lamp toward back of VideoProcessor **(B)**, lifting up at same time **(C)**. Lamp assembly will tilt upward. Pull to remove old lamp from socket **(D)**. Replace with new lamp, taking care not to bend pins. Remove plastic cap and reseat lamp in operating position, taking care not to touch white thermal component on lamp.
- Examine cone socket in cabinet (where grease is). If required, clean lens window with alcohol and cotton swabs. Do not remove grease from cone socket surface.
- Lamp Position: Grasp lamp cooling fins with thumb and finger. Push up or down gently to move assembly. Lamp is properly seated if no movement occurs.
- Replace VideoProcessor cover.



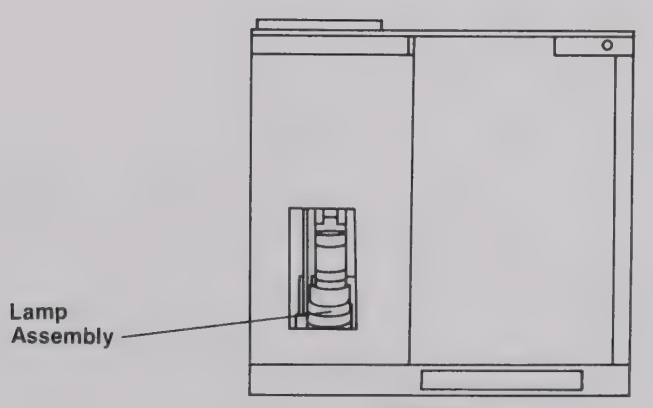
B



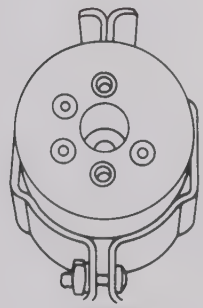
C



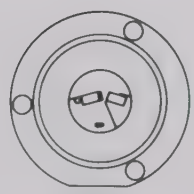
D



FRONT
A



LAMP
SOCKET



LAMP
(FRONT VIEW)

Figure 12

Maintenance
(Continued)

VideoProbes

LENS GUARD Replacement

LENS GUARD (pg. 1-2) should be replaced if it appears cracked or worn. Rotate counterclockwise to remove; replace with a new LENS GUARD.

Lens Cleaning

Moisten cotton-tipped applicator with Lens Cleaning Solution (pg. 1-2). Clean debris from OBJECTIVE LENS AND SENSOR (pg. 1-7).

Storage

VideoProbe

- Make sure that both STEERING DEFLECTION BRAKES (pg. 1-7) are released.
- VideoProbe should be stored with INSERTION TUBE (pg. 1-6) and UMBILICAL CORD (pg. 1-6) as straight as possible. If coiling is necessary, INSERTION TUBE and UMBILICAL CORD should not be wound too tightly.
- VideoProbes should not be stored in areas exposed to temperature extremes or high humidity.

VideoProcessor, Monitor, and Character Generator Keyboard should be stored in cool, dry area.

Other manufacturers accessories should be stored per their recommendations.

Troubleshooting

VideoProbe™ 2000 Troubleshooting

VideoProbes

Unable to Pass Tools

1. Straighten scope and release STEERING DEFLECTION BRAKES (pg. 1-7).
2. Remove accessory from WORKING CHANNEL PORT (pg. 1-7) and inspect for damage according to manufacturer's instructions.
3. Remember, VideoProbes have 2.7 mm diameter channel. Is accessory too large?
4. Try to dislodge obstruction by gently probing with tip of Cleaning Brush. If resistance is still severe, stop.
5. Using high volume syringe and large gauge blunt needle, insert needle through WORKING CHANNEL PORT. Try blowing obstruction free by using air pressure.
6. Insert tool into TIP SECTION (pg. 1-6) to determine position of clog. If within one foot of the tip, repeat procedure 3 above, this time from the TIP SECTION.
7. Call Welch Allyn Service Hotline.

No Light From Light Guides

1. Is VideoProcessor Power Cord plugged in?
2. Is VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6) properly seated in VIDEOPROBE TERMINAL PORT (pg. 1-9)?
3. Are VIDEO and LAMP SWITCHES (pg. 1-8,9) turned on and lit?
4. Is FREEZE FRAME SWITCH (pg. 1-9) off?
5. Is lamp properly seated (pg. 6-6)?
6. Call Welch Allyn Service Hotline.

Other Specific Problems

No Image

1. Is Monitor power on?
2. Are there any loose connections?
3. Are VideoProcessor's VIDEO and LAMP SWITCHES (pg. 1-8,9) depressed and lit? Light should be pulsating at TIP SECTION (pg. 1-6).
4. Are FREEZE FRAME SWITCH (pg. 1-9) and FREEZE FRAME REMOTE SWITCH OFF?
5. Is VTR power on, if used?
6. Is VIDEOPROBE CONNECTOR TERMINAL (pg. 1-6) seated firmly in VIDEOPROBE TERMINAL PORT (pg. 1-9)?
7. If replaying videotape, is RGB/VIDEO SWITCH (pg. 1-11) on front of Monitor in VIDEO position? In RGB position during live procedure?
8. Depress RESET key (pg. 3-2) on keyboard.
9. Disconnect Character Generator Keyboard from VideoProcessor. If image returns, Character Generator is defective.
10. Call Welch Allyn Service Hotline.

Other Specific Problems
(Continued)

No Audio (Videotape Playback)

1. Was audio recorded during procedure?
2. Check Audio Cable connections (pg. 2-4) (color-coded gray) to verify they are connected to proper terminal and are secure.
3. Is VOLUME CONTROL (pg. 1-10) turned up?

No Videotape Playback

1. Has videotape been rewound?
2. Is RGB/VIDEO SWITCH (pg. 1-11) on Monitor in VIDEO position?
3. Are Monitor and VTR (if used) turned on?
4. Check audio and video cables. Are they connected securely to proper terminals?
5. Refer to VTR owner manual for VTR Troubleshooting.
6. Call Welch Allyn Service Hotline.

Fuzzy Image

1. Wash OBJECTIVE LENS AND SENSOR (pg. 1-7). Wipe off excess water.
2. Is FREEZE FRAME SWITCH (pg. 1-9) off?
3. Call Welch Allyn Service Hotline.

Poor Color

1. **During Procedure:**
   - Remember—image appears black and white under room light.
   - Is RGB/VIDEO SWITCH (pg. 1-11) on Monitor in RGB position?
   - Inspect Video Cables for breaks or tears.
2. **During Videotape Playback:**
   - Is RGB/VIDEO SWITCH in VIDEO position?
   - Is VTR playing at normal speed, and tracking correctly?
   - Color may be adjusted at Monitor using tint and color controls at front center, below screen. (Consult Welch Allyn service representative for adjustment.)
3. Call Welch Allyn Service Hotline.

Character Generator Keyboard Information Not in Right Location

1. Depress RESET (pg. 3-2) key on keyboard (On Page 1)
2. Hold down PAGE key (pg. 3-2) and depress CLEAR key (pg. 3-2). (On Page 1)
3. Call Welch Allyn Service Hotline.

Other Specific Problems
(Continued)

Keyboard Memory Does Not Function

1. Check for dead battery
2. Turn off processor.
3. Remove 3 Phillips Head screws on each side of character generator.
4. Remove 2 Phillips Head screws below cable at back of character generator.
5. Remove bottom access cover by sliding complete cover sideways.
6. Remove 2 Phillips Head screws from the large printed circuit board.
7. Remove printed circuit board from housing by lifting and sliding board and cable.
8. Battery is located on top side of printed circuit board.
9. Replace battery with a duracell #DL 2032 or equivalent.
10. Reverse above procedure to reassemble.

Repairs to the VideoProcessor

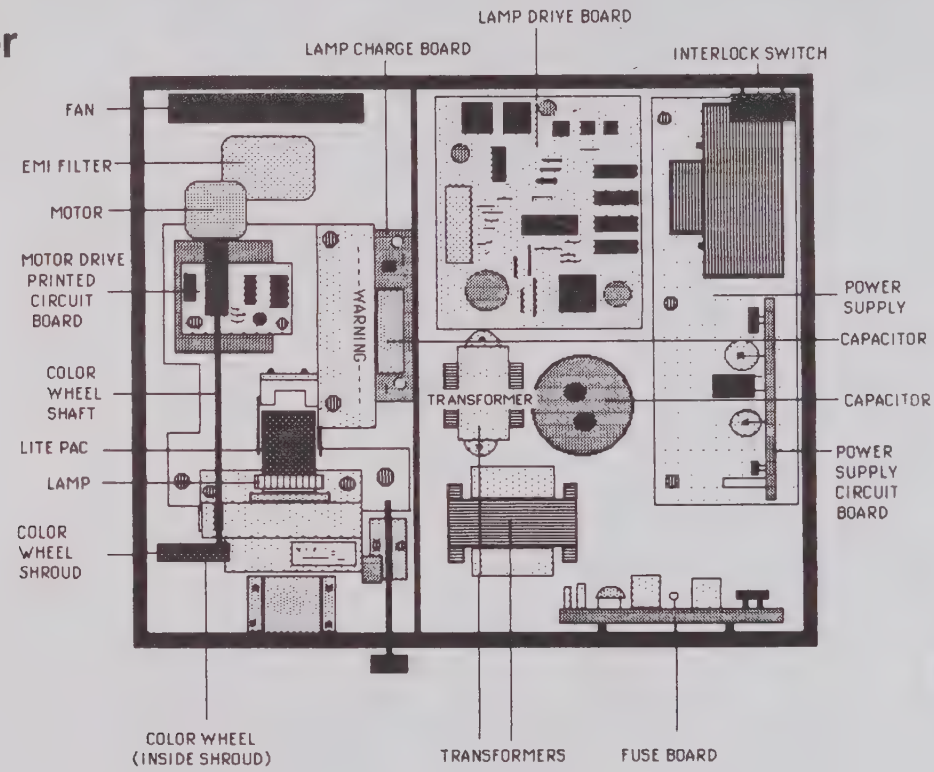
The VideoProcessor repairs are divided into two different sections: mechanically oriented repairs, such as broken switches, burned out motor or lamp, loose components, misaligned color wheel, worn bearings and interlock malfunctions, and electrical repairs, particularly in the printed circuit boards and their components. If the malfunction appears to be mechanical, then see *Mechanical Problems in the VideoProcessor* (pg. 6-4); if the malfunction appears to be electrical (that includes nearly all types of imaging problems), then see *Electrical Problems* (pg. 6-12).

The first step to any VideoProcessor repair is to remove the chassis covers. This is the first procedure written up in the mechanical section.

WARNING: There are two capacitors inside the VideoProcessor, each housing a strong charge. A voltage exists across the terminals of these capacitors both when the power is on and for the first several minutes after the power is disconnected. Active voltages also exist in the power supply and fuses (see diagram) when the power is on; pay attention not to touch these.

A diagram appears on the following page showing the major components of the VideoProcessor. It is recommended that this be studied closely before any repair procedures begin.

Repairs to the VideoProcessor
(Continued)



Mechanical Problems in the VideoProcessor

The VideoProcessor may have either electrical or mechanical problems; this section deals with its mechanical problems. Below is a listing of certain mechanical malfunctions that may occur in the processor, and the page number of where their repair procedure can be found.

Repairs to the VideoProcessor
(Continued)

1. **Burned Out Lamp:** There is no light output at the distal end of the scope when the color/black and white switch is in the "color" position (provided the electrical signals reaching the lamp are correct; see *Electrical Problems* (pg. 6-12) for details). See *Lamp Replacement* (pg. 6-6).
2. **Broken Switches:** One or more of the front five (or two, or three depending on the system) malfunctions. See *Broken Switches* (pg. 6-7).
3. **Fan Malfunctions:** Fan does not operate properly. See *Fan Malfunctions* (pg. 6-9).
4. **Motor Malfunction:** The motor that connects to the color wheel shaft does not function correctly despite a correct electrical signal input. See *Electrical Problems in the VideoProcessor* (pg. 6-12 for details). See *Motor Malfunction* (pg. 6-9).
5. **Color Wheel Malfunctions:** Most likely the ball bearings on the color wheel have become worn, resulting in a slower turning of the color wheel. A grating noise can be heard coming from the color wheel as a result of the increased friction and resistance caused by the worn bearings. The result seen on the monitor is an image that "rolls" in colors from red to blue to green in a cyclic manner. Do not confuse this problem with an electrical malfunction; the electrical signals that reach the motor and lamp are correct.

   Some of the components in the color wheel assembly are susceptible to damage; if any of these components (such as the color wheel shroud, filters, or clamp) fail to function properly, then follow the procedure below to replace it. See *Worn Bearings in The Color Wheel* (pg. 6-10).

Chassis Disassembly and Reassembly

All repairs made to the VideoProcessor unit will require disassembly and reassembly of the cabinet.

1. Turn off all switches on the VideoProcessor.
2. Remove the power plug from the wall socket and the VideoProcessor.
3. Remove the VideoProbe Connector Terminal (that is, the interface module) from the VideoProbe Terminal Port.
4. Remove the four white Phillips Head screws, two on each side of the cabinet.
5. Grasp the cover on each side between the screw holes and lift straight up.
6. Upon removal of the cover, two shields can be seen which protect the insides of the unit. Remove the two Phillips Head screws which keep these shields together, and then snap the shields off of the cabinet.

Repairs to the VideoProcessor
(Continued)

7. To access the VideoProcessor printed circuit board, the base of the unit must be removed. Tip the cabinet to expose the base. Identify those Phillips Head screws that keep the base in place. There are six such screws, two on the top and on the bottom, and one on each side. Remove these six screws and carefully pull the cover off, being aware of the plugs on the back side of the cabinet base. To reassemble the base, simply replace the hardware using a Phillips Head screwdriver.
8. At this point, most all of the chassis is ready for repair. Plug the power cord back into the VideoProcessor.
9. Reassemble the cabinet in reverse order, as stated in steps 1 through 6.

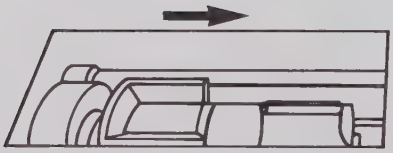
Lamp Replacement

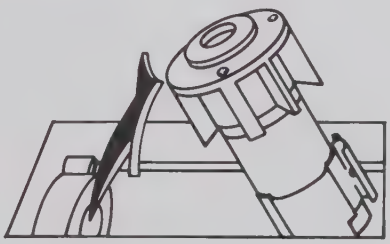
Diagnosis:

No light output when the light switch is on and the black and white color switch is in the color position, regardless of which scope is used.

Treatment:

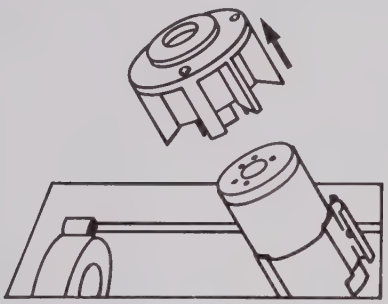
1. Disassemble the chassis as in steps 1 through 6 of *Chassis Disassembly* (pg. 6-5).
2. Open the replacement lamp carton and examine the replacement lamp for damages. Do not remove the plastic cap.
3. Working from the front of the cabinet, place thumb and forefinger on the split clamp in the rectangular opening and push straight back until the lamp is free from the cone socket. During this operation the entire assembly should be lifted up and back (rotated on the hinge pin). Avoid getting white grease on the socket, lenses, or cabinet opening.





Repairs to the VideoProcessor
(Continued)

4. Grasp the back fin area and pull the lamp from the socket with a straight outward action while holding the split clamps.



5. Examine the cone socket in the cabinet (where the grease is). If required, clean the lens window with alcohol and cotton swabs. Do not remove the grease from the cone socket surface.
6. Locate the flat edge of the lamp cone ring and grasp the plastic cap with the right hand thumb and forefinger on the side with the flat edge. With the left hand, hold the socket, and plug the lamp into socket with a straight pushing action.

WARNING: Check the lamp pins for alignment. DO NOT wiggle the lamp back and forth. Make sure that the lamp is firmly sealed and not cocked at an angle.

7. Remove the plastic cap while holding the hinged assembly. Do not allow the new lamp to touch any part of the cabinet. Examine the lamp window and remove any grease with alcohol and cotton swabs.
8. With the thumb and the forefinger, push the split clamp back until the lamp will rotate down freely into the lamp cone socket. Gently wiggle the lamp, and then assemble to seat in the cone.
9. Reassemble the cabinet.

Broken Switches

Diagnosis:

Switch malfunctions can be identified rather easily by inspection. The switch may not fully depress, or the switch may not be illuminated when depressed, or other similar minor malfunctions will occur when the switch is broken.

Treatment:

1. Disassemble the covers and protective shield as in steps 1 through 6 of *Chassis Disassembly* (pg. 6-5).
2. The front cover must be removed to get at the switches. In order to remove the front right cover, however, the front left cover must be removed. Begin removing the left cover by loosening the color/black and white knob with an Allen wrench. This is done on the bottom side of the knob. Pull the knob off.

Repairs to the VideoProcessor
(Continued)

3. Remove the Phillips Head screw that attaches the bottom of left cover to the cabinet frame. Pull off the left cover.
4. To remove the right cover, the three Phillips Head screws that hold the right cover to the frame must be loosened. There is one screw on each side and the bottom of the cover. Loosen them, and remove the right cover slowly.
5. Disconnect all of the electrical connections on the fuse board by unsnapping the white, plastic pin connectors.
6. Identify which switch is malfunctioning. All of the wires must be removed from the switch. *Before removing the wires, be sure to mark down which connector attaches to which wire.* This will facilitate the reassembly process. Remove the wires using a solder gun.
7. The switches are screwed very tightly into position. If necessary, the switches may be removed using pliers. Remove the malfunctioning switch.
8. Replace with a new switch. *The switch must be screwed into place as tightly as possible without stripping the plastic ridges on the outside of the switch.* Screw the switch into position as tightly as possible by hand, and then *carefully* tighten it up using pliers. Epoxy can be used on the end of the switch if so desired.
9. Resolder all of the wires onto their correct positions.
10. Replace all of the white, plastic pin connectors by snapping them back into position. Pay close attention to snap the right connectors together.
11. Reassemble the right cover by first replacing the Phillips Head screws on the bottom of the cover and then on the two sides.
12. Assemble the left cover by carefully sliding it into position and then screwing it into place with a Phillips Head screw.
13. Screw the color/black and white knob back into place using an Allen wrench.
14. Reassemble the shields and the covers as in the *Chassis Disassembly and Reassembly* process.

Repairs to the VideoProcessor
(Continued)

Fan Malfunctions

If the fan should fail to operate, the following procedure should be used to repair it.

1. Remove the covers and shields as in steps 1 through 6 of *Chassis Disassembly* (pg. 6-5).
2. Go to the back side of the VideoProcessor. Remove the four Phillips Head screws and lockwashers which hold the fan screens in place. Remove the fan screens.

NOTE: The fan screens should be replaced about once every one year of use. If the screens need replacing, put in new ones.

3. Disconnect the electrical cord connector from the fan. This connector pulls straight off the receptacle located on the side of the fan.
4. From the back side of the chassis, remove the four Phillips Head screws and lockwashers. Take the fan out of the cabinet by tipping it and pulling it out.
5. Replace with a new fan. Screw it into place with the four screws and lockwashers, attach the electrical plug, attach the three fan screens using the four screws and lockwashers, and replace the covers as instructed in *Chassis Reassembly* (pg. 6-5).

Motor Malfunction

Diagnosis:

The motor is either completely burned out so that the color wheel shaft does not rotate, or it is rotating too slowly, despite the proper signals being fed into the motor. If it is rotating too slowly, see the *Worn Bearings* section (pg. 6-10).

Treatment:

1. Disassemble the chassis as in steps 1 through 6 of *Chassis Disassembly.*
2. Locate the motor inside the cabinet. It is at the rear end of the long shaft on the left side of the chassis, near the fan.
3. Loosen the two set screws on the shaft coupling closest to the motor with an Allen wrench.
4. The back side of the motor is attached to a plate. At the base of this plate are two Phillips Head screws connecting the motor back plate to a base plate. Remove these two screws.
5. Remove the pin connectors from the color wheel printed circuit board.
6. The motor and the motor back plate are now free to be removed. Pull the motor and its plate off gently.
7. Remove the motor from the plate by loosening the three Phillips Head screws and pulling the motor off.
8. Replace with a new motor, screwing it back onto the motor back plate.
9. Position the motor and plate back into place. Attach the motor back plate to the base plate with the two Phillips Head screws.
10. Tighten the two set screws with an Allen wrench.
11. Plug the pin connectors back onto the board.
12. Reassemble the chassis shields and covers.

Repairs to the VideoProcessor
(Continued)

Worn Bearings on the Color Wheel Shaft: Color Wheel Assembly Plates Replacement

Diagnosis:

The color wheel does not spin fast enough, resulting in poor image color on the monitor. This malfunction can be distinguished from an electrical malfunction by a harsh grating sound coming from the color wheel.

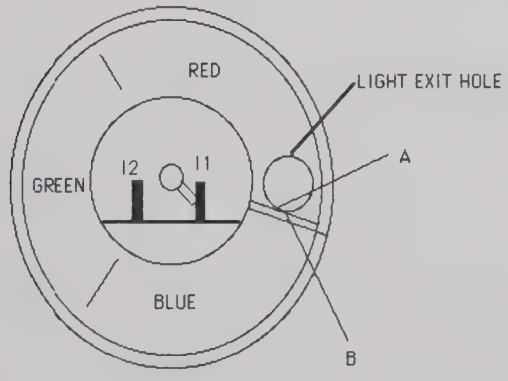
Treatment:

1. Disassemble the covers and the protective shields as in steps 1 through 6 of *Chassis Disassembly* (pg. 6-5).
2. Remove the front left cover. Remove the Phillips Head screw on the bottom side of the left cover and pull off.
3. Remove the black shroud covering the color wheel by loosening the three Phillips Head screws that hold it in place.
4. There is a large rectangular plate on the front side of color wheel called the connector plate. After removing the two Phillips Head screws on this plate, pull it off gently, so as not to damage the color wheel.
5. The lamp and the lite pac can be relocated as one assembly by pushing the assembly to the rear and swinging it up. Prop the assembly in this position to provide working room.
6. To disconnect the motor, loosen the two coupling set screws closest to the color wheel. Next, remove the two Phillips Head screws that connect the motor mount base to the plate underneath it. Unplug the motor wires from the Motor Drive printed circuit board and remove the motor and base from the plate.
7. Loosen the four set screws on the retaining collar of the color wheel and remove the color wheel. Remove the two Phillips Head screws holding the color wheel mounting bracket to the base plate. Remove the two Phillips Head screws securing the bearing retainer at the motor end of the shaft. Slide the motor end bearing and retainer off the shaft and pull the shaft out of the front bearings.
8. Remove the two Phillips Head screws and remove the optics assembly (consists of bracket, 2 shaft bearings and lens).
9. Replace the optics assembly with a new assembly. Install the two Phillips Head mounting screws *but do not tighten until shaft alignment has been made.*
10. Slide the shaft into the new front bearings. Slide the new rear bearing and retainer onto the motor end of the shaft and secure the retainer with two Phillips Head screws.

CAUTION: Tighten both screws equally using a torque driver. Proper alignment of the shaft depends on the correct tightening.

Repairs to the VideoProcessor
(Continued)

11. Remount the motor bracket and carefully insert the shaft into the coupling. Do not tighten the coupling set screws yet. Complete the tightening of the optics assembly. Plug the motor's electrical connector into the Motor Drive board.
12. IT IS ESSENTIAL THAT THE COLOR WHEEL BEARINGS BE AXIALLY PRE-LOADED. This procedure is most easily done with two people. Rotate the collar on the color wheel hub to position the four set screws to fall 45° from the four hub slots. Place the color wheel on the shaft. Have one person hold the shaft snap ring against the rear of the bearing while also holding the color wheel assembly against the front of the bearings. The second person then should tighten the four set screws on the color wheel collar. When correctly installed, there should be no axial movement of the shaft.
13. Attach the connector plate to the front of the optics assembly using the two large Phillips Head screws and split lockwashers.
14. Position the color wheel shroud and attach using the three Phillips Head screws, split lockwashers and flat washers.
15. Replace the lamp and lite pac by switching the assembly down and pushing it toward the rear. When in correct position, allow the assembly to spring forward against the lens assembly.
16. Check to be sure that all wire connections are secure.
17. To check the color wheel timing, there is a three step procedure which must be followed:
    a) disconnect the motor plug P9. Using suitable light to illuminate the light exit hole in the color wheel assembly, rotate the color filter wheel clockwise (looking from the front) so that the lower edge "A" of the red filter is tangent to the lower edge "B" of the light exit hole. See figure below:



Lock the shaft in place or precisely mark the position on the outer circumference of the color wheel with respect to the stationary frame.

Repairs to the VideoProcessor
(Continued)

b) turn the VideoProcessor "on" and connect an oscilloscope probe or voltmeter to I_1 (pin 7, J8). The color filter wheel must be precisely located as in the first step. Adjust the timing shaft location by loosening the set screws and rotating the shaft clockwise (looking from the front) until I_1 rises to 2 volts ± 1 volt. Tighten one set screw.

c) check the adjustment by positioning the plastic web between the red and blue color filters in the center of the bottom half of the light exit hole. I_1 should measure less than 1 volt. Slowly rotate the color filter wheel clockwise until the lower edge "A" of the red color filter is tangent to the lower edge "B" of the light exit hole. At this point I_1 should be greater than 1 volt and less than 4 volts. I_1 should change rapidly between .5 and 5 volts as the color filter wheel is rotated positively or negatively two degrees about this point. After the adjustment has been made correctly, then tighten the remaining set screws.

18. Slide the front left cover back into place, and tighten the Phillips Head screw at the base of this cover.
19. Replace the covers as described in the *Chassis Reassembly* section (pg. 6-5).

Electrical Problems

This section concerns itself with electrical malfunctions; particularly, electrical malfunctions in the VideoProcessor. The standard list of symptoms that begins every section is found on page 6-13, *Repair Procedure for Electrical Malfunctions.*

CAUTION: THERE ARE SEVERAL COMPONENTS INSIDE THE VIDEOPROCESSOR HAVING ACTIVE VOLTAGES. The large blue capacitor in the middle of the box and the silver capacitor under the warning cover both have large voltages when the power is on as well as for the first several minutes after the power is turned off, so pay attention not to touch their terminals. When the power is on, the power supply and the fuses also have active voltages, so be careful not to accidentally touch either of these.

A common electrical malfunction is a blown fuse. Be sure to check all of the fuses for proper functioning before beginning any of the repair procedures.

Repairs to the VideoProcessor
(Continued)

Chassis Disassembly and Reassembly

All repairs made to the VideoProcessor unit will require disassembly and reassembly of the cabinet.

1. Turn off all switches on the VideoProcessor.
2. Remove the power plug from the wall socket and the VideoProcessor.
3. Remove the VideoProbe Connector Terminal (that is, the interface module) from the VideoProbe Terminal Port.
4. Remove the four white Phillips Head screws, two on each side of the cabinet.
5. Grasp the cover on each side between the screw holes and lift straight up.
6. Upon removal of the cover, two shields can be seen which protect the insides of the unit. Remove the two Phillips Head screws which keep these shields together, and then snap the shields off of the cabinet.

CAUTION: Inside the cabinet is a large blue capacitor. This capacitor may still have a significant amount of charge in it.

7. To access the VideoProcessor printed circuit board, the base of the unit must be removed. Tip the cabinet to expose the base. Identify those Phillips Head screws that keep the base in place. There are six such screws, two on the top and on the bottom, and one on each side. Remove these six screws and carefully pull the cover off, being aware of the plugs on the back side of the cabinet base. To reassemble the base, simply replace the hardware using a Phillips Head screwdriver.
8. At this point, most all of the chassis is ready for repair. Plug the power cord back into the VideoProcessor.
9. Reassemble the cabinet in reverse order, as stated in steps 1 through 7.

Repair Procedure for Electrical Malfunctions

Diagnosis:

There is no picture on the screen when the VideoProbe is plugged into the VideoProcessor, or there is a poor quality image on the monitor screen. The malfunction has been narrowed down to the VideoProcessor and not the monitor or connecting cables (because of the exchange of system elements done at the beginning of the manual; see *Where to Begin?* in the introductory pages).

Procedure:

There are several potential problem sources inside the VideoProcessor and the next step is to pinpoint the exact component. Begin by removing the covers from the chassis as in steps 1 through 9 of the *Chassis Disassembly* procedure (pg. 6-13).

Repairs to the VideoProcessor
(Continued)

1. To determine if the VideoProcessor printed circuit board is the problem source, first check for loose components on the board. If any are found, and the component is usable, then reinsert the component; if the component is not usable or if the malfunction persists with the reinserted component, then remove the board and send it Welch Allyn for repairs. See page 6-15 for details of removing a board.

   If no loose components are found, check the following:

   Malfunction in RGB mode
   - Put the monitor switch on RGB
   - Remove the VideoProbe terminal from the VideoProbe terminal port
   - Examine the color bars. The color pattern should be as follows: black, royal blue, red, pink, green, light blue, yellow, white from left to right. If this color pattern does not appear clearly on the screen, or if the color bars appear to have a monochromatic tint, then there is an error in either the analog-to-digital converter, in one of the primary color memories, or in the digital-to-analog converter. To repair these malfunctions, the board should be removed and sent to Welch Allyn for repair. To install a new board see *Board Replacement and Adjustment* (pg. 6-15).

   Malfunction in Composite Mode
   - Put the monitor switch on composite
   - Examine the color bars. If the pattern is not precisely the same as noted above, then there is a malfunction in the color video encoder of the processor board. The board should be removed and sent to Welch Allyn for repairs; to install a new board, see *Board Replacement and Adjustment* (pg. 6-15).

NOTE: The color controls on the monitor function in the composite mode only. These controls may need to be adjusted at this time.

Other Malfunctions in VideoProcessor Printed Circuit Board
- By analyzing the electrical signals coming in and out of the VideoProcessor Board, problems in other parts of the board can be isolated. To check these signals, an oscilloscope must be used, and the resulting waveforms must correspond to those found in Appendix B, VideoProcessor Voltages. For further details of this procedure, see the APPENDICES A and B.
- If the measurements found in either the character generator (J10) connector, Video Output (J6) connector, or the switches (J3) connector do not correspond to their proper voltage readings (see Appendix B), the Videoprocessor board should be removed and sent to Welch Allyn for repairs.
- If the signals at J5 (motor drive signals) do not correspond to the signals shown in Appendix D (J8, pins 1 through 6), then the VideoProcessor Board should be returned to Welch Allyn for repair.
- If the measurements found at Power Supply Connector P2 (with P2 unplugged from J2) **DO** correspond to their proper DC voltage levels **AND** the signals at J2 (with P2 and J2 connected) **DO NOT** correspond to the voltage levels (see Appendix B), then the VideoProcesor Board

Repairs to the VideoProcessor
(Continued)

should be returned to Welch Allyn for repairs. See *Board Replacement and Adjustments* (pg. 6-15).

2. Lamp Drive Board Malfunctions—If none of the above isolate the offending component, then the Lamp Drive Board should be checked. If no loose components are found, then the electrical signals coming in and out of this board must be found and compared with the waveforms and voltages found in the Appendix, Lamp Drive Board Voltages. For details of this procedure, see Appendix A, and for the correct voltages on the Lamp Drive Board, See Appendix C. If the signals from the VideoProcessor Board (J11) are not the proper voltages, then the VideoProcessor Board should be replaced. If the readings at either the Lamp Charge Board (J13) connector or Strobe Lamp (J14) connector are wrong, then the Lamp Drive Board should be replaced. See *Board Replacement and Adjustment* (pg. 6-15).
3. Motor Drive Board Malfunctions—Check for loose components as in 1 and 2 above. If none are found then the voltages across the connectors in the Motor Drive Board must also be measured and compared to their proper readings as recorded in Appendix D. If the signals at the Motor (J9) connector or at pins 7 and 8 of the VideoProcessor Board (J8) connector are not the proper values, then the Motor Drive Board must be removed and replaced. If the voltages at pins 1 through 6 of the VideoProcessor Board (J8) are not correct, then the VideoProcessor Board should be replaced. See *Board Replacement and Adjustment* (pg. 6-15).
4. Other Checks—If no electrical malfunction is found in the VideoProbe, monitor, cables, or any of the printed circuit boards, it is recommended that they be all checked a second time. Some commonly overlooked malfunctions include poor electrical connections and defective electrical cables. There are also mechanical problems that the VideoProcessor may have; see *Mechanical Problems in The VideoProcessor* (pg. 6-4) for details. If no signs of failure are found, and the malfunction is known to be in the VideoProcessor, then it should be returned to Welch Allyn for repair.

Board Replacement and Adjustment

If the malfunction has been traced to a printed circuit board, it must be removed, returned to Welch Allyn, and replaced by a new board. The replacement of the new boards also includes a number of circuit board fine adjustments which only can be made once the new board has been put into the system.

Board Removal and Replacement

It is essential that the system be unplugged before the removal begins.

1. **Motor Drive Board**
   - Unplug the J9 and the J8 connectors
   - Remove the ground connection
   - Unscrew the two Phillips Head screws on the board, and remove them from the board.

Repairs to the VideoProcessor
(Continued)

- Remove the board, paying close attention not to lose the small black spacers on the underside of the board. *Be careful not to damage the pin protruding from the color wheel shaft; this would result in color wheel misalignment.*
- Replace with a new motor drive board. Once again, *be careful not to damage the pin connected to the color wheel shaft.* Because of the location of the color wheel shaft, the process of Motor Drive Board replacement requires patience. Remember to replace the black spacers on the underside of the board.
- Screw the board tightly into place.
- Reassemble the J8 and J9 connectors and replace the ground wire.

2. **Lamp Drive Board**
   - Unplug the Jll, J12, J13, and the J14 connectors.
   - The board is held into place by four white plastic spacers. To remove the board, pinch the top of the spacers with a pair of pliers, and pull the board straight up.
   - Replace with a new board, using the same spacers.
   - Replace the connectors.
3. **VideoProcessor Board**
   - Unplug all of the connectors on the board.
   - The board is held into place by four white plastic spacers. To remove the board, pinch the top of the spacers with a pair of pliers, and pull the board straight up.
   - Replace with a new board, using the same spacers.
   - Replace the connectors.

Board Adjustments

Once the malfunctioning board has been identified and replaced, the following board adjustments must be made to insure optimum quality of the video image. Failure to make the adjustments results in poor image quality.

Adjustment Set-Up

1. Preset TEKTRONIX 465B OSCILLOSCOPE to prescribed settings. See Appendix E.
2. Preset TEKTRONIX 520A VECTORSCOPE to prescribed settings. See Appendix E.
3. Preset TV MONITOR CONTROLS to prescribed settings. See Appendix E.
4. Connect the equipment in the following manner:
   - Connect the VIDEOPROCESSOR OUTPUT to the SCOPE EXT TRIG INPUT using a 75 ohm RG59 cable and a BNC "T" connector.
   - Using a second 75 ohm RG59 cable, connect the VECTORSCOPE CH A INPUT (J1) to the BNC "T" connector at the SCOPE EXT TRIG INPUT.
   - Terminate the 75 ohm cable at the VECTORSCOPE with a 75 ohm BNC termination connected to CH A J2.
   - Connect the VIDEOPROCESSOR RGB OUTPUT with an RGB CABLE ASSEMBLY to the TV MONITOR RGB INPUT.

Repairs to the VideoProcessor
(Continued)

5. Initial system settings:
   - Front Panel Switches: VIDEO "ON"; COLOR-B/W to "COLOR"; LIGHT, FREEZE FRAME, "OFF".

NOTE: If no VECTORSCOPE is available, there are alternate adjustment steps using just an OSCILLOSCOPE; see steps 11 through 15 of the procedure below.

VideoProcessor Board Electrical Adjustment Procedure

NOTE: After each adjustment has been made, the newly adjusted control adjuster must be locked as per Appendix F.

1. Red D.C. Level Adjust (R307); Red Video Amplitude Adjust (R306)
   - CH 1 SCOPE PROBE (10X) on TP R (TP R is a long thin metal pin sticking out from the board, with a yellow "R" written next to it); GROUND LEAD ON TP GND (another pin, located between R-Y and B-Y MOD BAL ADJUST, with "GND" written next to it in yellow).
   - SCOPE settings as per Appendix E.
   - Adjust RED D.C. LEVEL ADJUST (R307) precisely for OV baseline. (Precheck VERTICAL POSITION for OV level with GND input.) Spec. OV ± .15V.
   - Change CH 1 VOLTS/DIV to .5 VOLTS/DIV
   - Adjust RED VIDEO AMPLITUDE ADJUST (R306) for 3.0V waveform peak. Spec. 3.0V ± .15V.
2. GREEN D.C. LEVEL ADJUST (R346); BLUE VIDEO AMPLITUDE ADJUST (R346)
   - CH 1 PROBE on TP G (test point green, a pin located near TP R, with a yellow "G" written next to it)
   - Reset CH 1 VOLTS/DIV to 50 mV/DIV
   - Adjust GREEN D.C. LEVEL ADJUST (R307) precisely for OV waveform baseline. Spec. OV ± 10 mV.
   - Change CH 1 VOLTS/DIV to .5 VOLTS/DIV
   - Adjust GREEN VIDEO AMPLITUDE ADJUST (R326 for 3.0V waveform peak. Spec. 3.0V ± .15V
3. BLUE D.C. LEVEL ADJUST (R347); BLUE VIDEO AMPLITUDE ADJUST (R346)
   - CH 1 PROBE on TP B (test point blue, a pin located near TP G, with a yellow "B" written next to it)
   - Reset CH 1 VOLTS/DIV to 50 mV/DIV
   - Adjust BLUE D.C. LEVEL ADJUST (R307) precisely for OV waveform baseline. Spec. OV ± 10 mV
   - Change CH 1 VOLT/DIV to .5 VOLTS/DIV
   - Adjust BLUE VIDEO AMPLITUDE ADJUST (R346) for 3.0V waveform peak. Spec. 3.0V ± .15V
4. PREFERRED R-Y & B-Y MODULATOR BALANCE ADJUST (R402, R411) USING TEKTRONIX 520A VECTORSCOPE
   - Connect TEKTRONIX 520A VECTORSCOPE to VIDEO-PROCESSOR as per part (4), ADJUSTMENT SET-UP.
   - Make the VECTORSCOPE settings as per Appendix E.
   - Present the CHROMA AMPLITUDE ADJUST (R424) so that the small end of the RED COLOR BAR VECTOR falls in the SMALL "R" BOX.

Repairs to the VideoProcessor
(Continued)

- Preset the BURST AMPLITUDE ADJUST (R437) so that the end of the BURST VECTOR falls on the 100% MARK
- Change the VECTORSCOPE CHANNEL A GAIN switch to the MAX GAIN position
- Alternatively adjust R-Y MOD. BAL. ADJ. (R402) and the B-Y MOD. BAL. ADJ. (R411) to move the bright dot (representing residual 3.58 MHz signal) to the exact center of display (which represents no residual 3.58 MHz color signal corresponding to "no color" or "modulator balance"). THIS IS A VERY IMPORTANT ADJUSTMENT! Spec. dot within 1/4 inch radius ctr.

5. PREFERRED CHROMA AMPLITUDE ADJUST (R424) and BURST AMPLITUDE ADJUST (R437)
   - Use VECTORSCOPE
   - CHANNEL A GAIN switch should be switched to the 100% VECTORS position. The GAIN control should be rotated fully upwards to the CAL position. (the VECTOR-SCOPE should be fully warmed up and calibration checked by inspecting the test circle in the A CAL, 75% VECTORS
   - Adjust the CHROMA AMPLITUDE ADJUST (R424) to position the end of the RED COLOR BAR VECTOR in the center of the SMALL "R" SQUARE
   - Adjust the BURST AMPLITUDE ADJUST (R437) to position the end of the BURST AMPLITUDE VECTOR on the 100% MARK
6. COLOR BAR VECTOR DISPLAY TOLERANCE CHECK
   - With the VECTORSCOPE CALIBRATED PHASE CONTROL set to 0 degrees, adjust the CHANNEL A PHASE CONTROL to align the BLUE COLOR BAR VECTOR with the center of the SMALL "B" SQUARE
   - Spec: to align each of the other vectors with the center of its corresponding box must require no more than ± 5 degrees adjustment of the CALIBRATED PHASE CONTROL from the zero position
   - Spec: the amplitude of each vector must fall within the imaginary boundary that lies halfway between the SMALL (2%) BOX and the LARGE (20%) BOX. The BURST VECTOR should fall within an area equal to a SMALL BOX centered on the 100% MARK.
7. PREFERRED SYNC AMPLITUDE ADJUST (R447)

   Change VECTORSCOPE settings as noted below:
   - Change CHANNEL A gain switch to 75% vectors
   - Push Y-VIDEO LEVEL switch "IN". (VECTOR switch should pop out)
   - LUMINANCE GAIN control should be rotated fully upwards to the CAL position
   - The tip of the HORIZONTAL SYNC PULSE viewed on the display should fall on the -40 IRE LINE
   - Adjust SYNC AMPLITUDE ADJUST (R447) so that BLANKING LEVEL (which determines the upper limit of the SYNC PULSE) falls on the ZERO (O) IRE LINE. Spec ± 4 IRE.
   - The upper peak of the staircase waveform (corresponding to the white bar) is not adjustable, but should fall within 5 IRE units of the 100 IRE LINE

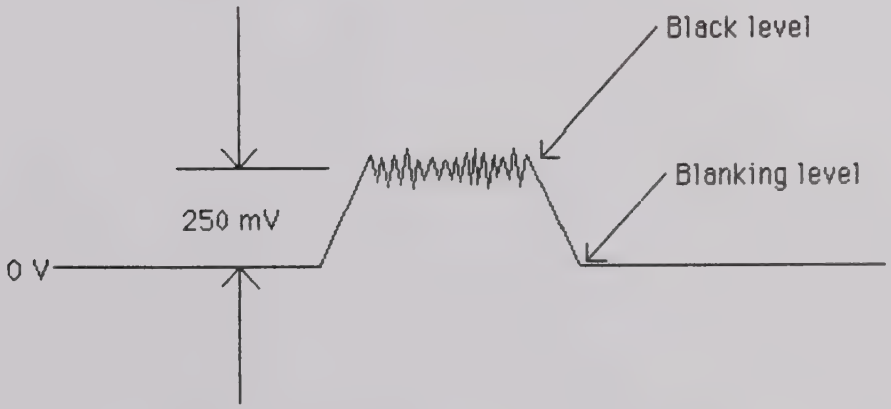
Repairs to the VideoProcessor
(Continued)

8. MAX GAIN ADJUST (R214)
   - CHANNEL 1 PROBE on TP V7; GROUND LEAD on TO GND (near J0)
   - CHANNEL 1 VOLTS/DIV at .5 VOLTS/DIV
   - Short TP AGC to adjacent TP GND. This defeats the automatic gain control.
   - Connect a 15K resistor between BLANK (jct R213 & pin #10 U203) and TP V4. This applies a 125 mV p-p signal at TP V4 representative of full-well white.

NOTE: VIDEOPROBE should not be plugged into VIDEOPROCESSOR

   - Adjust MAX GAIN ADJUST (R214) for 2V p-p (BLACK to WHITE) at TP V7. Spec. 2V p-p ± .25V
   - Remove the short between the TP AGC and TP GND. The signal at TP V7 should be reduced to 1V p-p by the automatic gain control. Spec. IV p-p ± .2V

9. BLACK LEVEL ADJUST (R243)
   - CHANNEL 1 PROBE on TP G; GROUND LEAD on TP GND
   - CHANNEL 1 VOLTS/DIV at 50 MV/DIV
   - Push LIGHT switch to the "OFF" position
   - With the BLACK VIDEO SCENE, adjust BLACK LEVEL ADJUST (R243) to increase the black level at TP G from 180mV above the blanking at minimum to 250mV above blanking. See illustration below. Spec. 250mV ± 25mV



10. Preferred ALC (AUTOMATIC LIGHT CONTROL) THRESHOLD ADJUST (R223)
    - Connect a 20K resistor between BLANK (jct R213 & pin #10 U203) and TP V4 (no VIDEOPROBE plugged into system)
    - Adjust the ALC THRESHOLD ADJUST (R223) fully clockwise and then advance slowly clockwise until the number of light pulses is reduced from fourteen to four. Spec. 6 pulses max.

Repairs to the VideoProcessor
(Continued)

- Test the automatic light control action by inserting the VIDEOPROBE and moving its tip towards and away from the white window slide several times at varying rates of speed. The ALC should decrease and increase the light to the appropriate levels within a half a second. The image should not appear "jumpy" or "erratic" and should not "oscillate" in and out of blooming or between light levels at any position where it is "active".

NOTE: The following adjustments are alternate methods to be used only if a VECTORSCOPE is not available.

11. ALTERNATE R-Y MODULATOR BALANCE ADJUST (R402), B-Y MODULATOR BALANCE ADJUST (R411) USING AN OSCILLOSCOPE
    - CHANNEL 1 PROBE on TP VCO; GROUND LEAD on TP GND (between R-Y & B-Y MOD. BAL. ADJ.)
    - SCOPE SETTINGS: See APPENDIX E; CHANNEL 1 at 50 MV/DIV. VIDEOPROCESSOR COMPOSITE VIDEO OUTPUT not 75 ohm terminated and connected to EXT TRIG through 10X probe
    - Preset CHROMA AMPLITUDE ADJUST (R424) to midrange if board has not been pretested
    - Alternately adjust R-Y MOD. BAL. ADJ. (R402) and B-Y MOD. BAL. ADJ. (R411) to minimize (null) 3.58 MHz signal seen on the tip of the horizontal sync pulses. THIS IS A VERY IMPORTANT ADJUSTMENT! Spec. 20MV p-p, max. 3.58 MHz.
12. ALTERNATE CHROMA AMPLITUDE ADJUST (R424); BURST AMPLITUDE ADJUST (R437) USING OSCILLOSCOPE
    - CHANNEL 1 PROBE ON TP CVO; GROUND LEAD on TP GND (between R-Y & B-Y MOD. BAL. ADJ.)
    - SCOPE SETTINGS as in APPENDIX E with CHANNEL 1 at .2 VOLTS/DIV, VERT POS adjusted as required. See 11 above for FXT TRIG setting.
    - Adjust CHROMA AMPLITUDE ADJUST (R424) for 1.14V p-p on the highest amplitude color bar. (At this point the bottom excursion of the 3.58 MHz signal on the GREEN COLOR BAR should be equal to BLACK LEVEL.) Spec. 1.14V p-p ± .1V.
    - Change CHANNEL 1 to .1 VOLTS/DIV
    - Adjust BURST AMPLITUDE ADJUST (R437) for burst amplitude equal to .570V p-p. Spec. .570V p-p ± .030V
13. ALTERNATE SYNC AMPLITUDE ADJUST (R447) USING OSCILLOSCOPE
    - CHANNEL 1 PROBE on TP CVO; GROUND LEAD on TP GND (between R-Y & B-Y MOD. BAL. ADJ.)
    - SCOPE SETTINGS as in APPENDIX E with CHANNEL 1 at .1 VOLTS/DIV VERT POS adjusted as required. See 11 above for EXT TRIG setting.
    - Adjust SYNC AMPLITUDE ADJ (R447) for sync amplitude equal to .570V. Spec. .570 ± .030V.

Repairs to the VideoProcessor
(Continued)

14. ALTERNATE MAX. GAIN ADJUST (R214) USING OSCILLOSCOPE
    - CHANNEL 1 PROBE on TP V7; GROUND LEAD on TP GND (near J0)
    - SCOPE SETTINGS as in APPENDIX E with CHANNEL 1 at .5 VOLTS/DIV, EXT TRIG as in 11 above.
    - Short TP AGC to adjacent TP GND (this defeats the automatic gain control)
    - Insert a VIDEOPROBE properly adjusted to provide 250MV p-p signal (full-well) at TP V3
    - Push the LIGHT switch on the VIDEOPROCESSOR "ON"
    - Insert the tip of the VIDEOPROBE into a TEST SLIDE HOLDING FIXTURE with a WHITE WINDOW TEST SLIDE in place. Adjust the VIDEOPROBE tip position to increase the illumination until the CCD is slightly into the "full-well" illumination level. This condition appears as a "WHITE FLATTENING" condition on the TV MONITOR and on the OSCILLOSCOPE
    - Adjust MAX GAIN ADJUST (R214) for 2V p-p (BLACK to WHITE) at TP V7. Spec. 2V p-p ± .25V
    - Remove the short from the TP AGC to TP GND; the signal at V7 should reduce to 1V p-p. Spec. 1V p-p ± .2V
15. ALTERNATE ALC (AUTOMATIC LIGHT CONTROL) THRESHOLD ADJUST (R223) USING OSCILLOSCOPE
    - Plug a properly adjusted VIDEOPROBE into the VIDEO-PROCESSOR and push the LIGHT button "ON".
    - Move the tip of the VIDEOPROBE into a test slide holding fixture containing a WHITE WINDOW SLIDE until the CCD begins to bloom. The ALC THRESHOLD ADJUST (R223) should be turned fully counterclockwise.
    - Turn the ALC THRESHOLD ADJUST (R223) clockwise until the light reduces to the point where the blooming has been eliminated. Advance the VIDEOPROBE closer to the WHITE WINDOW SLIDE; if blooming reappears, advance the control further clockwise to eliminate it.
    - Test the AUTOMATIC LIGHT CONTROL action by moving the tip of the VIDEOPROBE towards and away from the WHITE WINDOW SLIDE several times at varying rates of speed. The ALC should decrease and increase the light to the appropriate levels within a half a second. The image on the monitor should not appear "jumpy" or "erratic", and should not "oscillate" in and out of blooming or between light levels at any position where it is "active".

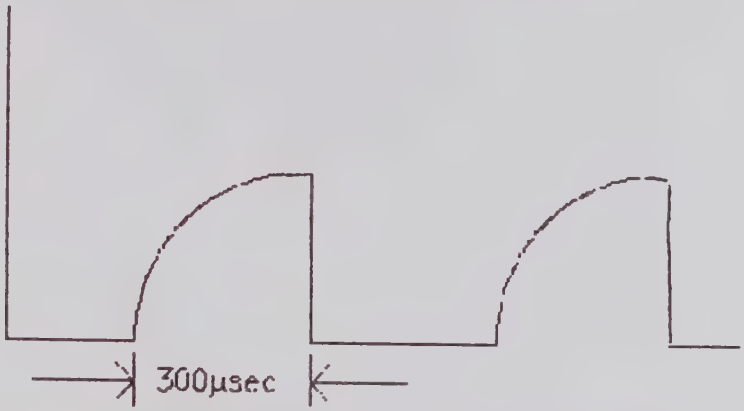
Lamp Drive Board Electrical Adjustment Procedure

NOTE: After each adjustment has been made, the newly adjusted control adjuster must be locked as per Appendix F.

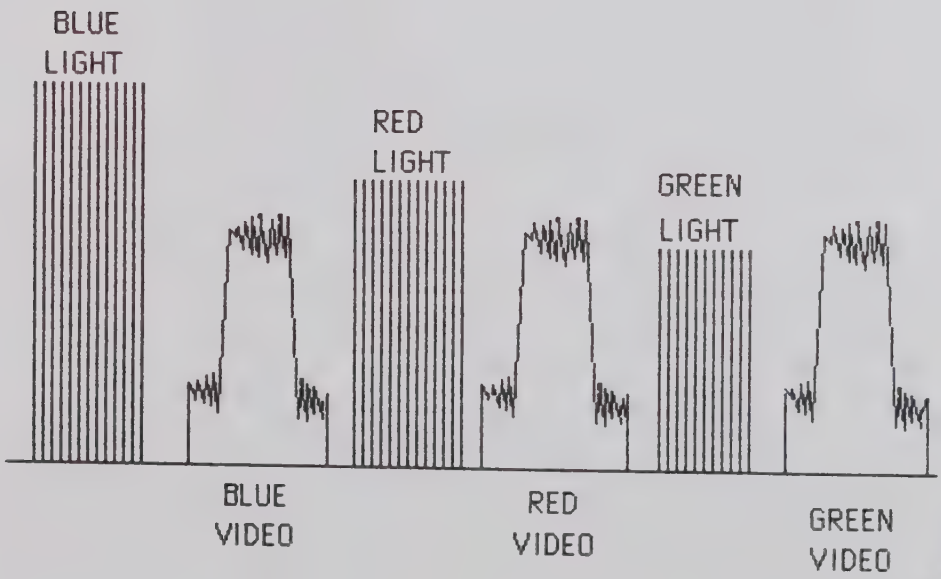
1. LAMP TRIGGER DELAY ADJUST (R655)
    - Connect the CHANNEL 2 100X probe to the junction of C643 (LAMP CHARGE CAPACITOR) and D632. Connect the GND lead to the CHASSIS GROUND.
    - Change OSCILLOSCOPE settings as follows: A TIME/DIV = 10MS/DIV, B TIME/DIV = 50uS/DIV

Repairs to the VideoProcessor
(Continued)

- Adjust OSCILLOSCOPE DELAY TIME POSITION to display one pulse of the 14 lamp charge pulse on one of the three color fields
- Adjust the LAMP TRIGGER DELAY ADJUST (R655) so that the time duration of one charge pulse equals 300 microseconds. Spec. 300usec ± 30usec.



2. RED (R626), GREEN (R627), AND BLUE LIGHT ADJUST (R628)—"WHITE BALANCE"
   - Change OSCILLOSCOPE settings as follows:
     —INPUT SELECT-CH 1, CH 2, CHOP
     —A TIME/DIV-10MS
     —B TIME/DIV-5MS
     —VOLTS/DIV-CH. 1 .2V/DIV
     —DELAY TIME POSITION—adjust to position blue lamp pulses to the left of the display



Repairs to the VideoProcessor
(Continued)

- Remove VIDEOPROBE and adjust BLUE LIGHT ADJUST (R628) for 450V peak on BLUE LAMP CHARGE VOLTAGE WAVEFORM. (Be sure that the CH 2 DC LEVEL has been properly zeroed on the OSCILLOSCOPE. Spec. 450V ± 15V)
- Insert the VIDEOPROBE into the VIDEOPROCESSOR and position its tip onto the TEST SLIDE HOLDING FIXTURE containing a WHITE WINDOW SLIDE so that the white window image is in the center of the monitor picture and the BLUE VIDEO WAVEFORM AMPLITUDE CH 1 equals .8V. (With the STANDARDIZED VIDEOPROBE the BLUE LAMP CHARGE VOLTAGE WAVEFORM should have remained at 450 V or *Vb* in step below.
- Adjust the RED LIGHT ADJUST (R626) so that the RED VIDEO WAVEFORM AMPLITUDE equals the BLUE VIDEO WAVEFORM AMPLITUDE. Spec. ± 10%.
- Record the RED LAMP VOLTAGE (*Vr*). *Vr* = 340V min., 440V max.
- Adjust the GREEN LIGHT ADJUST (R627) so that the GREEN VIDEO WAVEFORM AMPLITUDE equals the BLUE and RED VIDEO WAVEFORM AMPLITUDES. Spec. within ± 10% of both.
- Record the GREEN LAMP CHARGE VOLTAGE (*Vg*). *Vg* = 320V min., 390V max.
- Calculate and record total lamp power (Pt.) where: $Pt = 120 \times 10^{-6} (Vr^2 + Vg^2 + Vb^2)$ Spec. Pt = 50 watts min., 65 watts max.
- If Pt = 55 watts, then...
  —Calculate: N = Pt-55 and round off the value of N.
  —Readjust the BLUE LIGHT ADJUST (R628) so that the BLUE LAMP CHARGE VOLTAGE (*Vb*) = 450-5N. This 5 volt reduction is *Vb* for every watt of power over 55W.
  —Record the BLUE LAMP CHARGE VOLTAGE (*Vb*)
  —Repeat steps above from "Insert the VIDEOPROBE into the VIDEOPROCESSOR..." to the calculated value of *Pt* until the value of Pt is greater than 50W, but less than 56W.
- Measure the LIGHT OUTPUT using a STANDARD PROBE or FIBER BUNDLE and a WESTON FOOT CANDLE METER MODEL 614. Spec. LIGHT OUTPUT (L.O.) must measure 150 fc minimum.

Other System Problems

This final section of the repair manual concerns itself with problems that do not relate to either the probe or the VideoProcessor.

The character generator may malfunction in one of several ways. If the time and date fail to work properly, then see page 6-24, *Battery Replacement in the Alphanumerics.* If the information on the alphanumeric screen is lost, blinks on and off, or exhibits erratic characteristics, then see page 6-25, *Alphanumeric Malfunction.* If these procedures have been tried and problems persist, then the alphanumeric assembly should be returned to Welch Allyn for repair.

Repairs to the VideoProcessor
(Continued)

If the system malfunction is known to be in any of the connecting electrical cables, then the old cables should be returned to Welch Allyn and replaced with new ones. Electrical cable malfunction is common and is often confused with an electrical VideoProcessor malfunction; therefore, do not overlook cable failure when isolating the malfunction in the system.

If the system malfunction is isolated in the monitor, consult the Repair Manual for the monitor.

Battery Replacement in the Alphanumerics

Diagnosis:

Although the battery in the alphanumeric keyboard has an expected life of five years, it may fail before that because of handling or shipping damages. The battery controls all of the timing mechanisms of the alphanumerics, so its failure can be recognized by an improper (or an absence of the) time and date.

Treatment:

1. Unplug the alphanumeric keyboard from the VideoProcessor.
2. Locate the left side keyboard cover. It is a black plastic piece on the left side of the keyboard. Remove the three screws holding the cover in place and take the side cover off.
3. There are two screws that hold the connecting cord in place. They are located on the back side of the keyboard assembly. Remove the two screws to free the cord.
4. Locate the large black base plate. Slide this plate off by pulling it towards the previously removed left side cover.
5. There are two printed circuit boards now exposed with a speaker located between them. Remove the grey connector from the green circuit board.
6. There are two screws which hold the green circuit board in place. Remove these two screws carefully, being careful not to strip them. Slide the green printed circuit board and attached black connecting cord off the keyboard assembly.
7. The battery is located on the component side of the board. Remove and replace the battery with the positive side facing up.
8. Slide the green board with attached black connecting cord back onto the keyboard assembly. The board slides into place with the component side down and the connecting cord in the connecting cord slot. The end opposite the cord should rest on the frame with the screwholes of the board and those of the frame lined up. Reattach the grey connector to the green printed circuit board.
9. Reattach the board by inserting and tightening the two screws in place, *being careful not to strip the threads on the screws.*

Repairs to the VideoProcessor
(Continued)

10. Slide the black base plate back into position. The plate slides through two narrow slots on both sides of the keyboard assembly. The circuit boards and the speaker may have to be depressed for the plate to slide on.
11. Align the connecting cord and screw it back into position, using the two brass colored screws.
12. Replace the left side cover by replacing and tightening the three black Phillips Head screws, again *being careful not to strip the threads.*

Alphanumeric Malfunctions

Diagnosis:

The alphanumerics may not appear on the screen or may appear in the wrong places. The display may also blink on and off intermittently.

Treatment:

1. Unplug the alphanumeric keyboard from the VideoProcessor.
2. Locate the left side keyboard cover. It is a black plastic piece on the left side of the keyboard. Remove the three screws holding the cover in place and take the side cover off.
3. There are two screws that hold the connecting cord in place. They are located on the back side of the keyboard assembly. Remove the two screws to free the cord.
4. Locate the large black base plate. Slide this plate off by pulling it towards the previously removed left side cover.
5. There are two printed circuit boards now exposed with a speaker located between them. Check the battery on the green printed circuit board to be sure it is secured in place.
6. There are three large black chips on the board. Dirt or dust may become lodged in the connecting pins of these chips, or the chips may shake loose. Remove each of the three chips and clean the pins. Being careful not to damage the pins, reinsert the chips into their respective housings.
7. Slide the black base plate back into position. The plate slides through two narrow slots on both sides of the keyboard assembly. The circuit boards and the speaker may have to be depressed for the plate to slide on.
8. Align the connecting cord and screw it back into position, using the two brass colored screws.
9. Replace the left side cover by replacing and tightening the three black Phillips Head screws, again *being careful not to strip the threads.*
10. Check the alphanumerics for proper functioning. If the malfunction persists, send the alphanumeric assembly to Welch Allyn for repairs.

Repairs to the VideoProcessor
(Continued)

Appendix A

When checking the VideoProcessor for electrical malfunctions, the voltages across each pin of the connectors on the VideoProcessor Board, Motor Drive Board and Lamp Drive Board must be found and checked to those found in Appendices A, B, and C. A D.C. voltmeter can be used in many cases, such as when the voltage is ground or any other constant value. In other instances, however, an oscilloscope must be used to find the voltage, because the measurements are dynamic waveforms as opposed to constant voltage.

There are no special instructions for using the voltmeter to find the voltages. The voltmeter probe is just connected to the proper pin, the meter is set for the proper setting (volts) and scale, and the voltage is read. Note that all recorded voltages are normal values. The given voltages were measured at Welch Allyn using a standard Digital Multimeter.

When using the oscilloscope to find the waveform, there are certain settings which must be made. TV sync, a feature of some oscilloscopes, was not used when taking the photographs of the waveforms in Appendices A, B, and C, although it may be used by the servicer if so desired. The oscilloscope used by Welch Allyn to take the photographs was a Tektronix 2445 Oscilloscope, but a Tektronix 465B Oscilloscope can be used for good results as well. A 20X probe was used in all cases, except for pins 1 and 2 of connector J14, and pin 1 of J13 (both on the Lamp Drive Board) where a 100X probe was used. In all cases except those noted in the appendix, the Vertical Position was set at the 10% line (the second line from the bottom). The B delayed sweep was only used where noted in the diagrams, and the notes for Volts/Div and Time/Div are made in the diagrams as well.

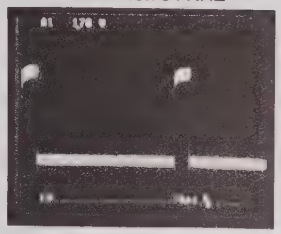
The set up for the VideoProcessor must also be clarified. When making all measurements, the "LIGHT" and the "VIDEO" buttons must be depressed unless otherwise noted. Other switches should only be depressed when specified in the Appendices.

CAUTION: When working inside the VideoProcessor with the power on, pay attention NOT to make any contact with either the large blue or the smaller silver capacitor. When the power is turned off, the capacitors retain the charge for about 15 minutes. The potential across each capacitor is high enough to cause serious injury, so do not touch either set of terminals.

Video Processor Voltages

Welch Allyn

PIN 4: 15.734 KHZ



10 MICROSEC/DIV

1 VOLT/DIV

PIN 5: PIN 6 GND

PIN 2 4 VOLTS WITH FREEZE FRAME OFF

0 VOLTS WITH FREEZE FRAME ON

PIN 3: PIN 4 GND

PIN 1 5 VOLTS

J4 TO LAMP DRIVE BOARD

J10 1 2 3 4

TO/F

CHARACTER

SEE J11, LAMP DRIVE BOARD VOLTAGES

Vid

Proce

Boa

PIN 2 GND

0 VOLTS WITH TRANSILLUM ON

1 VOLT WITH TRANSILLUM OFF

0 VOLTS WITH FREEZE FRAME ON

5 VOLTS WITH FREEZE FRAME OFF

J3 FROM SWITCHES

1

2

3

4

PIN 3 GND

J5 TO MOTOR DRIVE BOARD

TO VIDEO

J6 1 2 3 4

SEE J8, MOTOR DRIVE BOARD VOLTAGES

PIN 1 0 VOLTS

PIN 2 GND

PIN 3 NOT USED

PINS 5,

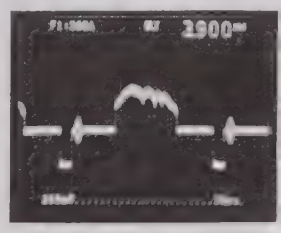
PIN 2 MEASUREMENTS MUST BE TAKEN IN ROOM LIGHT OR WITH FREEZE FRAME ON

WAVEFORM VARIES WITH IMAGE ON SCREEN

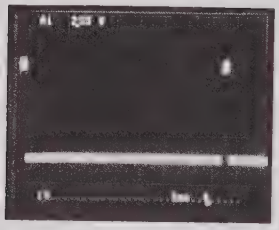
.2 VOLTS/DIV

2MS/DIV

PIN 2: FURTHER D



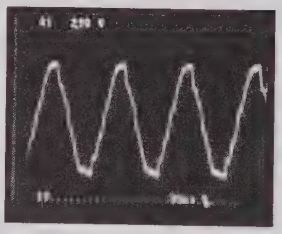
PIN 6: 60 HZ



1 VOLT/DIV

2 MS/DIV

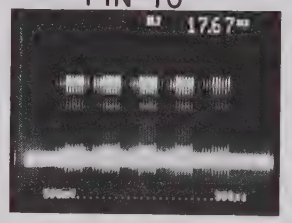
PIN 8: 7.16 MHZ



.05 MICROSEC/DIV

1 VOLT/DIV

PIN 10



.5 VOLTS/DIV

5MSEC/DIV

B DELAY SWP 1 MSEC/DIV

PIN 11

0 VOLTS IF THERE IS AN ACTIVE AREA ON SCREEN

2.5 VOLTS IF THERE ARE JUST ALPHANUMERICS

PIN 7: PIN 8 GND

PIN 9: PIN 10 GND

5 6 7 8 9 10 11

ROM

GENERATOR

eo

ssor

ard

J2

1 -24 VOLTS

2 PIN 1 GND

FROM POWER SUPPLY

3 18.5 VOLTS

4 PIN 3 GND

5 -12 VOLTS

6 12 VOLTS

7 PINS 5 & 6 GND

8 5 VOLTS

9 PIN 8 GND

TO/FROM INTERFACE MODULE J1 & J0

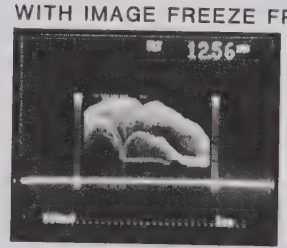
UTPUT

5 6 7 8

PINS 6, 7, & 8

WAVEFORM VARIES WITH IMAGE ON SCREEN

WITH IMAGE FREEZE FRAME ON CHARACTER GENERATOR ON



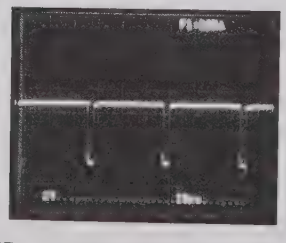
.5 VOLTS/DIV

2 MS/DIV

N 4

, 7, & 8 GND

PIN 5



2 VOLTS/DIV

20 MICROSEC/DIV

ETAIL

5 VOLTS/DIV

MS/DIV

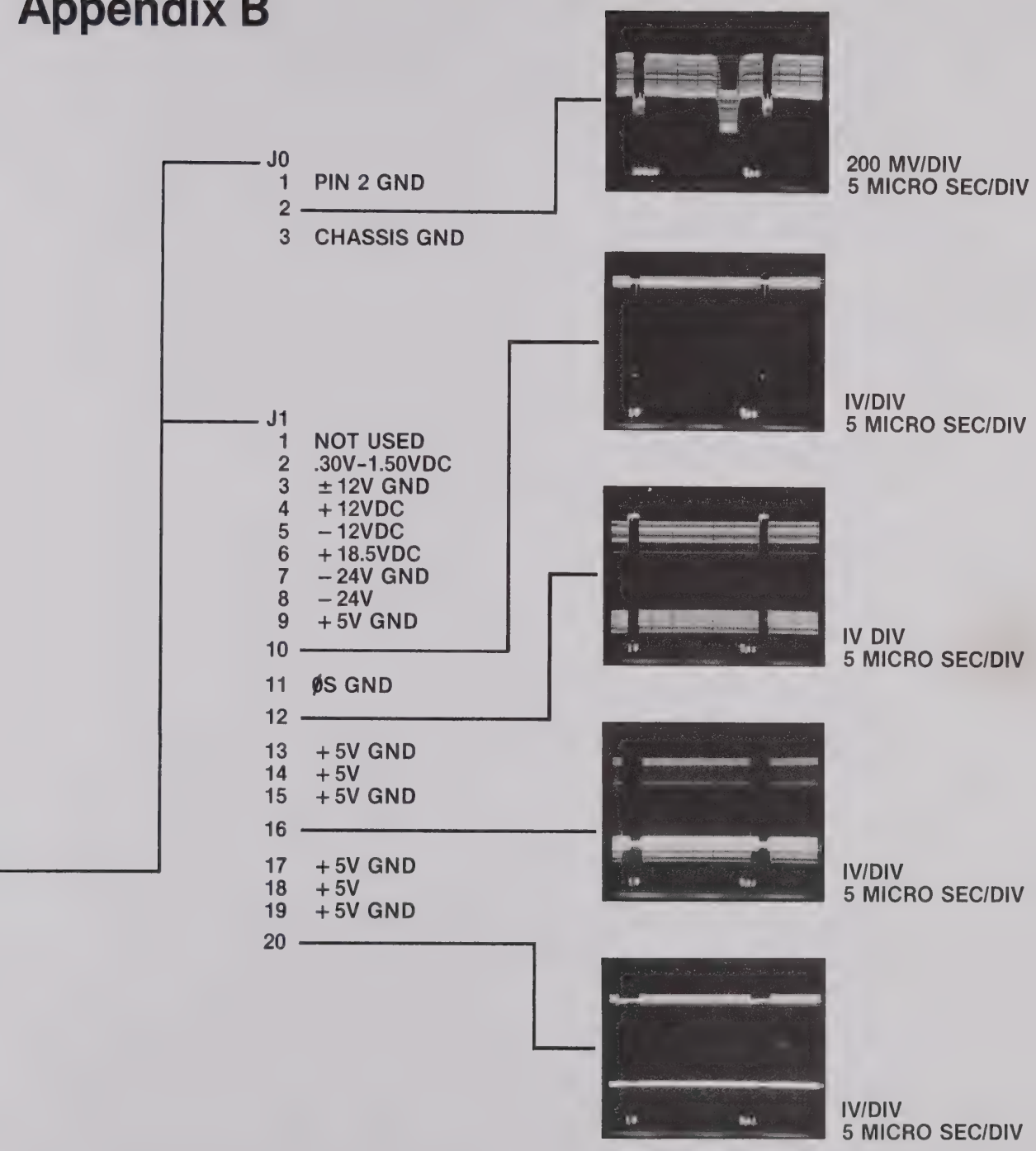
DELAYED SWP 10 MICROSEC/DIV

NO IMAGE ON SCREEN

.5 VOLTS/DIV

2MS/DIV

Appendix B

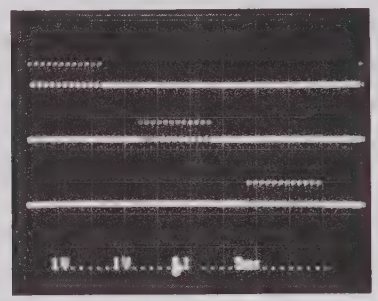


Video Processor Voltages
Welch Allyn VideoProbe
REPAIR MANUAL

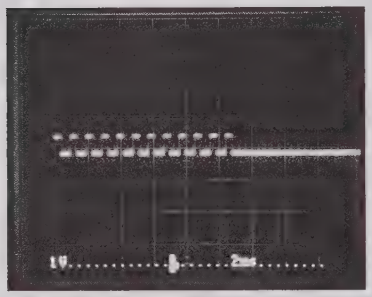
Welch Allyn

Lamp Drive Board Voltages

PROPER RELATIONSHIP OF J11,
PINS 2, 4, & 6 SHOWN BELOW



1 VOLT/DIV
5MS/DIV



LIGHT OFF

I VOLT/DIV
2 MS/DIV
0 VOLTS AT
BOTTOM LINE

PIN 2
GND AT PIN 5

PIN 3
5 VOLTS

PIN 4
&
PIN 6
SAME WAVEFORM
AS PIN 2

PIN 5
0 VOLTS

PIN 7
2 VOLTS

FUS

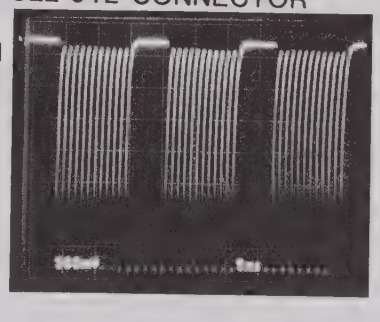
VIDE
7

Appendix C

PINS 1 & 2 139 VOLTS A.C.
USE TRUE A.C. VOLTMETER, PULL J12 CONNECTOR

PINS 3 & 4 16.5 VOLTS A.C.
USE TRUE A.C. VOLTMETER, PULL J12 CONNECTOR

LIGHT ON



2 3 4 J12

FROM
BOARD

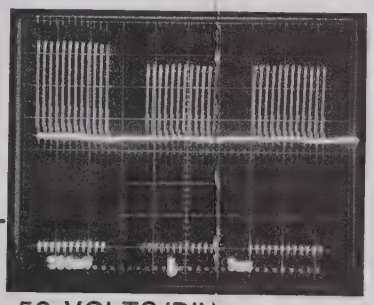
PINS 1 & 2
PROBE ON R678,
OPPOSITE 170 V
MARKINGS

GND PROBE ON
GND END OF D628

TO
STROBE 1
LAMP 2
J14

50 VOLTS/DIV
5 MS/DIV
0 VOLTS 50% LINE

amp
Drive
oard



PIN 1
POS PROBE AT
VCO (END OF R674)

GND PROBE AT
GND (END OF R673)

TO
LAMP
CHARGE
BOARD
1
2
3
J13

50 VOLTS/DIV
5MS/DIV

PINS 2 & 3 160-170 VOLTS
USE D.C. VOLTMETER OR ATTACH POS
PROBE TO POS TERMINAL OF BLUE
CAPACITOR AND GND PROBE TO GND
END OF R673
LEAVE J13 CONNECTED

FROM
PROCESSOR

5 4 3 2 1 J11

0 VOLTS
AT DARK SCENE

PIN 1

-.55 VOLTS
AT BRIGHT SCENE

Lamp Drive Board Voltages
Welch Allyn VideoProbe
REPAIR MANUAL

Welch Allyn

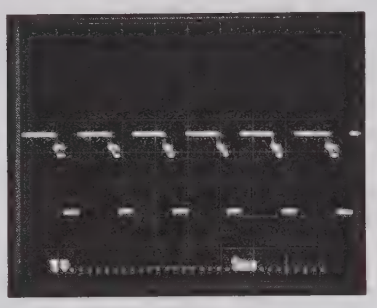
Motor Drive Board Voltages

PINS 1, 2, 3, & 4 GND AT T

THE WAVEFORMS OF EACH PIN

5 VOLTS/DIV

5MS/DIV



J9 1 2 3

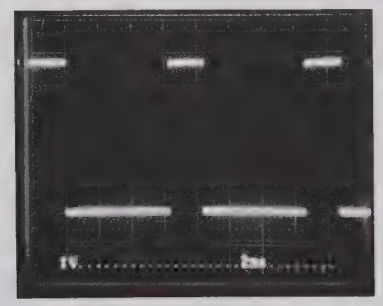
M
D
E

FROM
VIDEOPROCESSOR

PIN 1
12 VOLTS

PINS 2, 4, 5

THE WAVEFORMS OF THE INDIVIDUAL
PINS SHOWN BELOW



1 VOLT/DIV

2 MS/DIV

COMPO
WAVEF

5 VOLTS

1 MS/DIV

Appendix D

T POINT GND

OWN BELOW

PIN 5 12 VOLTS

5 TO MOTOR

tor
ve
ard

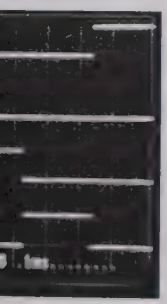
2 3 4 5 6 7 8 J8

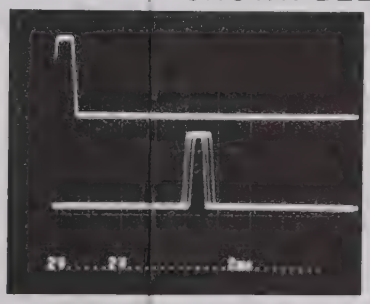
PIN 3
0 VOLTS

6 GND AT TEST POINT GND

PINS 7 & 8 SHARE SAME WAVEFORM
SHOWN BELOW

E VIEW OF ALL FOUR
S





2 VOLTS/DIV
2 MS/DIV

V

Motor Drive Board Voltages
Welch Allyn VideoProbe
REPAIR MANUAL

Repairs to the VideoProcessor
(Continued)

CAUTION: The fuse board and the power supply as well have an active charge on it when the power is on. Pay close attention not to make contact with either of these assemblies.

If it becomes difficult to touch the probe to one of the pins inside any of the connectors, simply attach a wire to the end of the probe, and then touch the wire to the pin. The ground pins are noted in the appendices; for example, pin 1 of the J6 connector (VideoProcessor Board) is ground for pin 2 of the same connector. Other special instructions are contained in the appendices.

Appendix E

Set Up Procedure for Board Adjustments

TEKTRONIX 465B OSCILLOSCOPE SETTINGS
(Unless otherwise specified)

PROBE—CH 1 10X, 13 pf, 10 meg, Short Ground Lead
CH 2 100X

1.	INPUT SELECT		CH 1
2.	VOLTS/DIV	CH 1	50 MV/DIV
3.	INPUT COUPLING	CH 1	DC
4.	VERTICAL POSITION	CH 1	-3 DIV (from ctr) = 0
5.	VOLTS/DIV	CH 2	1 V/DIV
6.	INPUT COUPLING	CH 2	DC
7.	VERTICAL POSITION	CH 2	-3 DIV (from ctr) = 0
8.	20 MHz BW LIMIT		ON (IN)
9.	A TRIGGER EXT. input signal supplied: negative sync		
10.	A TRIGGER control settings:		
	a. SOURCE		EXT
	b. COUPLING		TV FIELD
	c. TRIG MODE		NORM
	d. HORIZ DISPLAY		B DLY'D
	e. HOLD OFF		NORM
	f. SLOPE		(-)
11.	B (DLY'D) TRIGGER control settings:		
	a. SOURCE		STARTS AFTER DELAY
	b. COUPLING		----------
	c. SLOPE		----------
	d. LEVEL		----------
12.	A TIME/DIV		
13.	B TIME/DIV PULL DLY'D SWP, SET TO 5uS/DIV (VAR locked)		
14.			OFF (OUT)
15.	DELAYED TIME POSITION		adjust as required
16.	INTENSITY, FOCUS, SCALE ILLUM., HORIZ.. POS., B INTENSITY, TRACE SEP		adjust as required
17.	CH 2 INVERT		OFF (OUT)

NOTE: Check to be sure that both probes and both channel amplifiers are properly compensated and calibrated for sensitivity before proceeding with measurements.

Repairs to the VideoProcessor
(Continued)

TEKTRONIX 520A NTSC VECTORSCOPE SETTINGS

1.	CH A PUSH BUTTON	IN
2.	FULL FIELD BUTTON	IN
3.	AO BUTTON	IN
4.	VECTOR BUTTON	IN
5.	ALL OTHER BUTTONS	OUT
6.	POWER	ON
7.	CHANNEL A CONTROLS	
	a. GAIN SWITCH	100% VECTORS
	b. GAIN	rotated fully upwards towards CAL
	c. PHASE	adjusted to position BLUE COLOR BAR VECTOR on line with center of BLUE SQUARE
8.	CHANNEL B CONTROLS	DON'T CARE
9.	0 REF SWITCH	BURST
10.	LUMINANCE GAIN	rotated fully upwards to CAL
11.	CALIBRATED PHASE	0 deg.
12.	INTENSITY & SCALE ILLUM.	adjust as required
13.	LINE SELECTOR	DON'T CARE
14.	LOWER RIGHT TRAP DOOR CONTROLS	
	a. FOCUS	adjust as required
	b. SYNC	INT
	c. DIFF PHASE	DON'T CARE
	d. VERT POSITION	see text
	e. HORIZ POSITION	as required in text
15.	LOWER LEFT TRAP DOOR CONTROLS	refer to Tektronix 520A Vectorscope Manual for proper adjustment

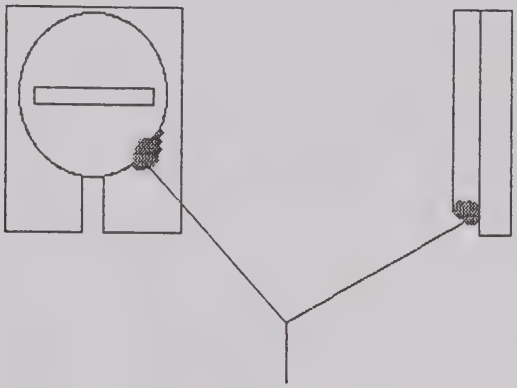
COLOR TV MONITOR SETTINGS

1. **Internal Adjustments**—to be adjusted for proper gray scale tracking, color temperature and focus.
2. **Black Level Control**—to be adjusted on a "black" scene so that the outer portion of the CRT corresponding to the "inactive area" of the picture is extinguished or "blacker than black", and the inner portion of the CRT, corresponding to the "active" portion of the picture is "just illuminated" so that none of the detail in a dark scene will be lost.
3. **Display Drive (Contrast)**—to be adjusted on COLOR BARS after the BLACK LEVEL CONTROL has been adjusted. It should be adjusted near maximum, but reduced to just below the point where the COLOR BAR PATTERN does not "change color" near the white bar after five minutes of continuous operation on that signal.
4. **RGB—COMPOSITE SWITCH—RGB (UP) POSITION.**

Repairs to the VideoProcessor
(Continued)

Appendix F

Potentiometer Locking Procedure



Apply as shown a drop of red GLPT insulating varnish, Welch Allyn #M13069.

Appendix G

Because of the risk of product liability, all material used in repair and adjustment procedures of the Welch Allyn VideoProbe must be approved by Welch Allyn. The following approved items are referred to in this manual:

- Thread—Monofilament fishing line, 4 pound test, .007 ± .001 inch diameter
- Deflux Solution—Isopropyl Alcohol and Arm and Hammer® baking soda in a saturated solution
- Loctite® 220
- Loctite® 222
- Loctite® 420
- Hysol Epoxy 0151 Clear
- Hysol DP5193 Black Dispersion
- Armstrong C7 Resin
- Armstrong W for C7 Resin
- Molykote® Z Powder by Dow Corning
- Almasol® 9200 Dry Film Lubricant
- Shur-Wipe® Disposable Wipers by Fort Howard Paper
- High Vacuum Grease by Dow Corning
- CP-28 Lubricant (from E/M Lubricants, Inc.)
- Red GLPT Insulating Varnish, Welch Allyn #M13069

Repairs to the VideoProcessor
(Continued)

Appendix H

Below is a list of Welch Allyn tools specific to the VideoProbe. Contact Welch Allyn, Inc. or Welch Allyn G.M.B.H. after May 1, 1985 to order any of these tools.

WT-0032	spanner wrench for power plug spider valve spanner wrench for nut inside power tube
WT-0033	wrench for retainer rings in the steering assembly
WT-0096	epoxy bead setter

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Appendix and Index

Specifications

VideoProbe™ 2000
Specifications

VideoProcessor

Operating Voltage	110/130VAC (Nom 115v), 60 Hz
Operating Current	1.8 Amps
Input Power	250w
Lamp	WA Lamp #86010
Lamp Life (50% of original brightness)	1000 Hours
Dimension H x W x D	8" x 16" x 16"
Weight	34 Lbs. (15.5 Kg.)

Monitor

Operating Voltage	85v-132v, 50 Hz; 60 Hz
Operating Current	1.3 Amps Max.
Input Power	70W Ave.
Dimension H x W x D	12.8" x 14.4" x 16.5"
Weight	34.1 Lbs. (15.5 Kg.)

VideoProbe™ 2000
Specifications

L_W—Working Length

L_U—Umbilical Cord Length

L_H—Head (Articulation Tip) Length

L_A—Articulating Section Length

D_W—Working Diameter

R_U—Umbilical Cord Radius

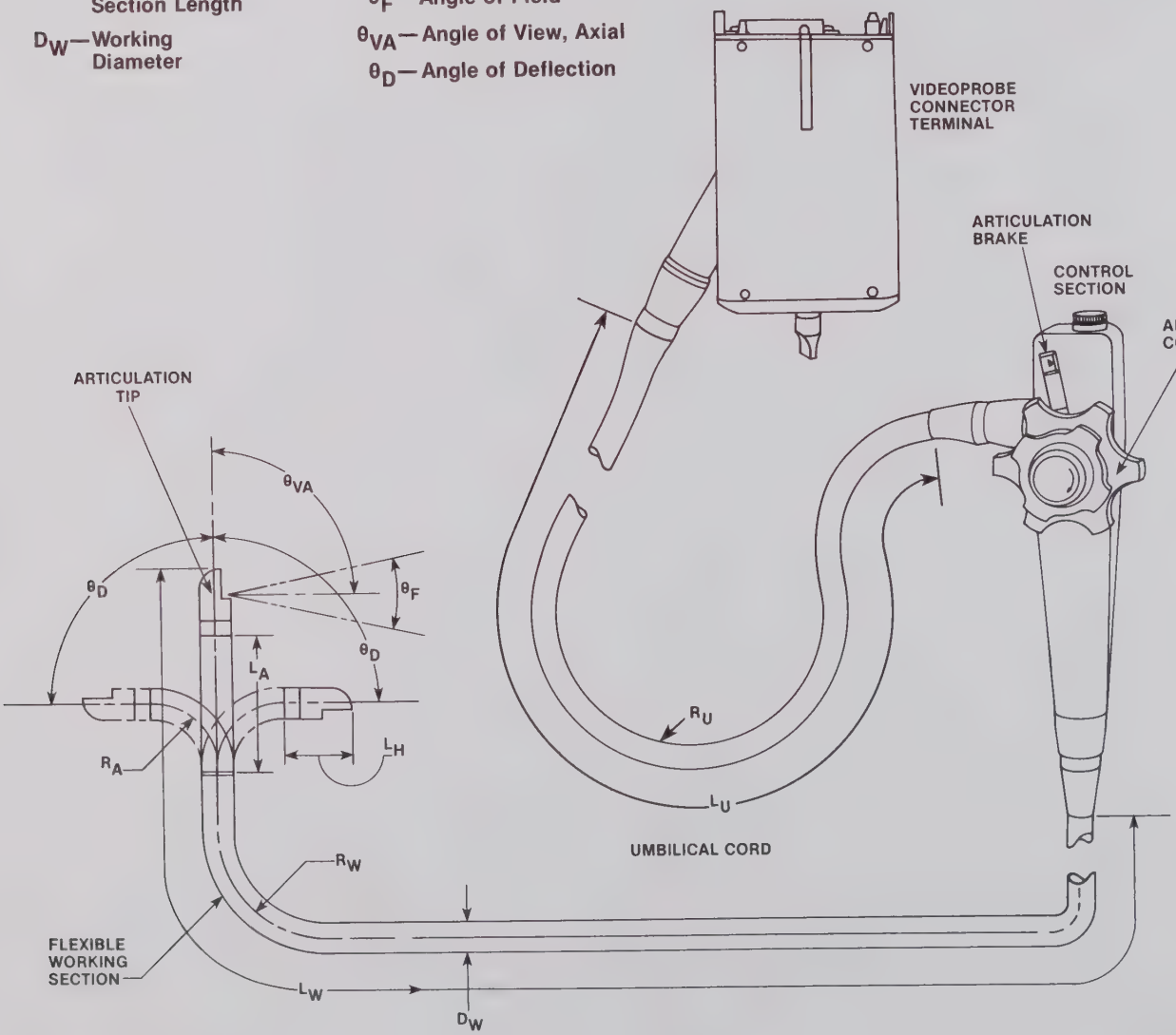
R_W—Working Section Bend Radius

R_A—Articulation Bend Radius

θ_F—Angle of Field

θ_{VA}—Angle of View, Axial

θ_D—Angle of Deflection



VideoProbe™ 2000 Specifications

9/16" x 4.9' x 4-Way Articulating

Table I

Drawing Symbol	Description	Specification
L_W	Working Length	4.9'
L_U	Umbilical Cord Length	5'
R_U	Umbilical Cord Radius	6"
L_H	Head Length	1"
L_A	Articulating Length	4-1/2"
D_W	Working Diameter	0.585"
R_W	Working Section Bend Radius	2"
R_A	Articulation Bend Radius	1"
θ_F	Angle of Field	90°*
θ_{VA}	Angle of View, Axial	0°
θ_D	Deflection Angle	Up 90° Down 90°
		Left 90° Right 90°
	Depth of Field	10mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Neoprene, Epoxy Urethane, Glass Thermoplastic, Stainless Steel
	Sheathing Insertion	Urethane, Braid
	Construction: Tube	Monocoil
	Right Angle Adapter	Mirror Type
	Working Channel	3mm

*Also Available in 30° and 60°

**Up to 10^4 R/HR Available

VideoProbe™ 2000
Specifications

1/2" x 20' x 4-Way

Table II

Drawing Symbol	Description	Specification
L_W	Working Length	20'
L_U	Umbilical Cord Length	5'
R_U	Umbilical Cord Radius	6"
L_H	Head Length	1"
L_A	Articulating Length	4"
D_W	Working Diameter	0.500"
R_W	Working Section Bend Radius	2"
R_A	Articulation Bend Radius	1"
θ_F	Angle of Field	90°*
θ_{VA}	Angle of View, Axial	0°
θ_D	Deflection Angle	Up 90° Down 90°
		Left 90° Right 90°
	Depth of Field	10mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Epoxy Glass, Neoprene
	Sheathing: Insertion	Neoprene, Braid, Monocoil
	Right Angle Adapter	Mirror Type
	Working Channel	None

*Also Available in 30° and 60°

**Up to 10^4 R/HR Available

VideoProbe™ 2000
Specifications

1/2" x 10' x 4-Way

Table III

Drawing Symbol	Description	Specification
L_W	Working Length	10'
L_U	Umbilical Cord Length	5'
R_U	Umbilical Cord Radius	6"
L_H	Head Length	1"
L_A	Articulating Length	4"
D_W	Working Diameter	0.500"
R_W	Working Section Bend Radius	2"
R_A	Articulation Bend Radius	1"
θ_F	Angle of Field	90°*
θ_{VA}	Angle of View, Axial	0°
θ_D	Deflection Angle	Up 90° Down 90° Left 90° Right 90°
	Depth of Field	10mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Thermoplastic, Glass, Epoxy, Neoprene
	Sheathing: Insertion	Monocoil, Braid, Neoprene
	Right Angle Adapter	Mirror Type
	Working Channel	None

*Also Available in 30° and 60°

**Up to 10^4 R/HR Available

VideoProbe™ 2000 Specifications

3/8" x 6' x 2-Way

Table IV

Drawing Symbol	Description	Specification
L_W	Working Length	6'
L_U	Umbilical Cord Length	5'
R_U	Umbilical Cord Radius	6"
L_H	Head Length	1-1/4"
L_A	Articulating Length	3"
D_W	Working Diameter	0.375"
R_W	Working Section Bend Radius	2"
R_A	Articulation Bend Radius	1"
θ_F	Angle of Field	90°*
θ_{VA}	Angle of View, Axial	0°
θ_D	Deflection Angle	Up 90° Down 90°
		Left N/A Right N/A
	Depth of Field	10mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Epoxy, Glass, Neoprene, Viton
	Sheathing: Insertion	Viton, Braid, Monocoil
	Right Angle Adapter	Mirror Type
	Working Channel	None

*Also Available in 30° and 60°

**Up to 10^4 R/HR Available

VideoProbe™ 2000
Specifications

3/8" x 15', 25' Non Articulating

Table V

Drawing Symbol	Description	Specification
L_W	Working Length	15', 25'
L_U	Umbilical Cord Length	N/A
L_H	Head Length	1-1/4"
L_A	Articulating Length	N/A
D_W	Working Diameter	0.375"
R_W	Working Section Bend Radius	2"
R_A	Articulation Bend Radius	N/A
θ_F	Angle of Field	90°*
θ_{VA}	Angle of View, Axial	0°
θ_D	Deflection Angle	Up N/A Down N/A
		Left N/A Right N/A
	Depth of Field	10mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°F
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Epoxy Glass, Viton
	Sheathing: Insertion	Monocoil, Braid, Viton
	Right Angle Adapter	Mirror Type
	Working Channel	None

*Also Available in 30° and 60°

**Up to 10^4 R/HR Available

VideoProbe™ 2000
Specifications

6MM x 6' x 2-Way

Table VI

Drawing Symbol	Description	Specification
L_W	Working Length	6'
L_U	Umbilical Cord Length	5'
R_U	Umbilical Cord Radius	6''
L_H	Head Length	1''
L_A	Articulating Length	2''
D_W	Working Diameter	0.240'' Max.
R_W	Working Section Bend Radius	1-1/2''
R_A	Articulation Bend Radius	1/2''
θ_F	Angle of Field	52°
θ_{VA}	Angle of View, Axial	0°, 90°
θ_D	Deflection Angle	Up 90° Down 90°
		Left N/A Right N/A
	Depth of Field	5mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Viton Glass, Epoxy, Neoprene
	Sheathing: Insertion	Viton, Monocoil
	Right Angle Adapter	Prism Type
	Working Channel	None

**Up to 10^4 R/HR Available

VideoProbe™ 2000
Specifications

6MM x 15', 25'
Non Articulating

Table VII

Drawing Symbol	Description	Specification
L_W	Working Length	15', 25'
L_U	Umbilical Cord Length	N/A
L_H	Head Length	1"
L_A	Articulating Length	N/A
D_W	Working Diameter	0.240" Max.
R_W	Working Section Bend Radius	1-1/2"
R_A	Articulation Bend Radius	N/A
θ_F	Angle of Field	52°
θ_{VA}	Angle of View, Axial	0°, 90°
θ_D	Deflection Angle	Up N/A Down N/A
		Left N/A Right N/A
	Depth of Field	5mm 100mm
	Radiation Tolerance	Special Order Only**
	Temperature Limitation	65°C or 150°C
	Chemical Resistance	Consult Factory
	Watertight	Yes—12 PSI
	Materials: External	Stainless Steel, Epoxy Glass, Viton
	Sheathing: Insertion	Monocoil, Viton
	Right Angle Adapter	Prism Type
	Working Channel	None

**Up to 10^4 R/HR Available

Characteristics

VideoProbe™ 2000 Characteristics

VideoProbe Resolution & Magnification

Definition of Resolution:

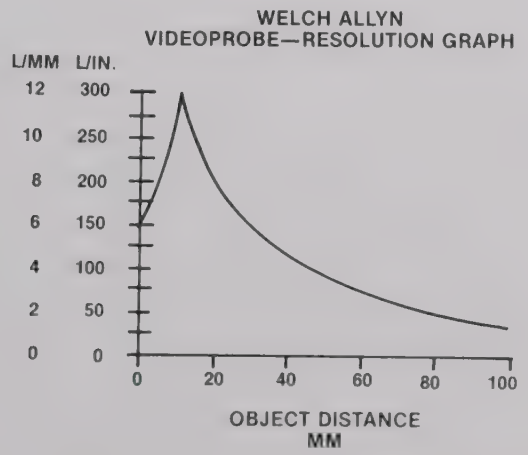
Resolution of an optical system is a measure of the system's ability to reproduce information from a given object to an image surface. This is often measured by using equally spaced black and white lines. Example: 5 black lines and 5 white lines in the space of a millimeter is 10 lines/mm.

Elements of the Welch Allyn VideoProbe Which Are Involved In Resolution:

Resolution is dependent on where the system is focused. The highest resolution will normally occur at the focal point. Things closer or farther away will be blurry. Other factors which affect resolution are the aperture diameter of the lens and the size and number of the picture elements on the image plane. When comparing a VideoProbe to a fiber scope, you must keep in mind that the human eye becomes the aperture of the fiber system. The pupil of the eye will increase or decrease depending on the brightness of the scene. If a camera is attached to the fiber scope system, the aperture will be much larger, thus, reducing the resolution. In the VideoProbe the aperture size does not change and resolution is always high.

Resolution Table

Object Distance	Welch Allyn VideoProbe L/in.	Welch Allyn VideoProbe L/mm	Bright Scene, Typical Fiber Scope L/in.	Bright Scene, Typical Fiber Scope L/mm	Dark Scene, Typical Fiber Scope L/in.	Dark Scene, Typical Fiber Scope L/mm	Typical Fiber Scope W/TV L/in.	Typical Fiber Scope W/TV L/mm
5mm	200	8.0	230	9.8	160	6.3	100	4.0
10mm	300	11.8	260	10.2	170	6.7	100	4.0
20mm	200	8.0	220	8.7	190	7.5	120	4.7
40mm	100	4.0	120	4.7	120	4.7	110	4.3
70mm	50	2.0	70	2.5	70	2.5	70	2.5
100mm	40	1.5	50	2.0	50	2.0	45	1.8



VideoProbe Resolution & Magnification
(Continued)

Definition of Magnification:

Magnification is the ratio of the size of a viewed image to the size of the actual object, with the viewed image size being measured directly off the monitor screen.

$$\text{Magnification} = \frac{\text{Image Size}}{\text{Object Size}}$$

Magnification of the Welch Allyn VideoProbes depend on:

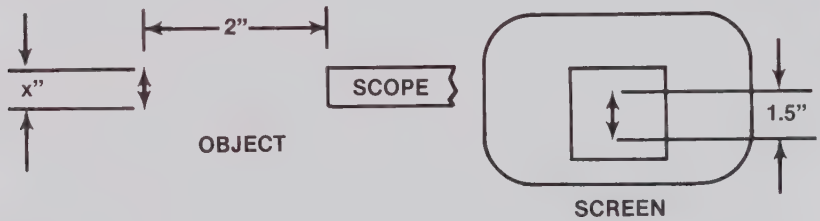
1. Object distance from scope tip
2. Screen size
3. Scope optics

The Welch Allyn VideoProbes have similar optics and, therefore, magnification depends only on the object distance and the screen size.

For a screen size of 13 inches:

$$\text{Magnification} = \frac{4.7}{\text{Object Distance (in inches)}}$$

Example:



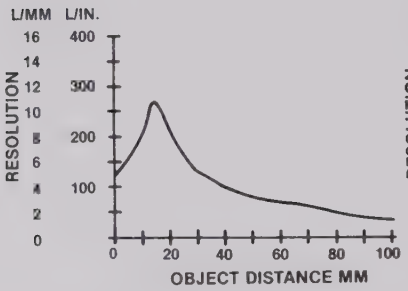
$$\text{Magnification} = \frac{4.7}{\text{Object Distance}} = \frac{4.7}{2} = 2.35$$

$$\text{Magnification} = \frac{\text{Image Size;}}{\text{Object Size}} \quad 2.35 = \frac{1.5}{x}$$

$$X \text{ (Object Size)} = \frac{1.5}{2.35} = .64''$$

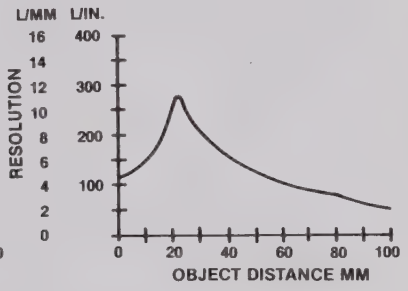
NOTE: Video frame image size on 13" Monitor is approximately 6" square.

VideoProbe Resolution & Magnification
(Continued)



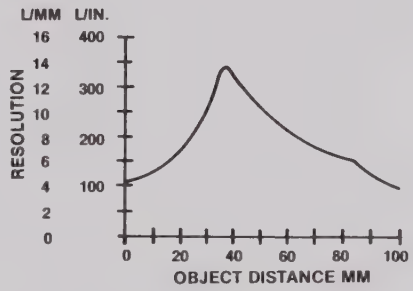
90° FIELD OF VIEW

$$\text{MAGNIFICATION} \sim \frac{4.7}{\text{OBJECT DISTANCE}}$$



60° FIELD OF VIEW

$$\text{MAGNIFICATION} \sim \frac{16.9}{\text{O.D.}}$$



30° FIELD OF VIEW

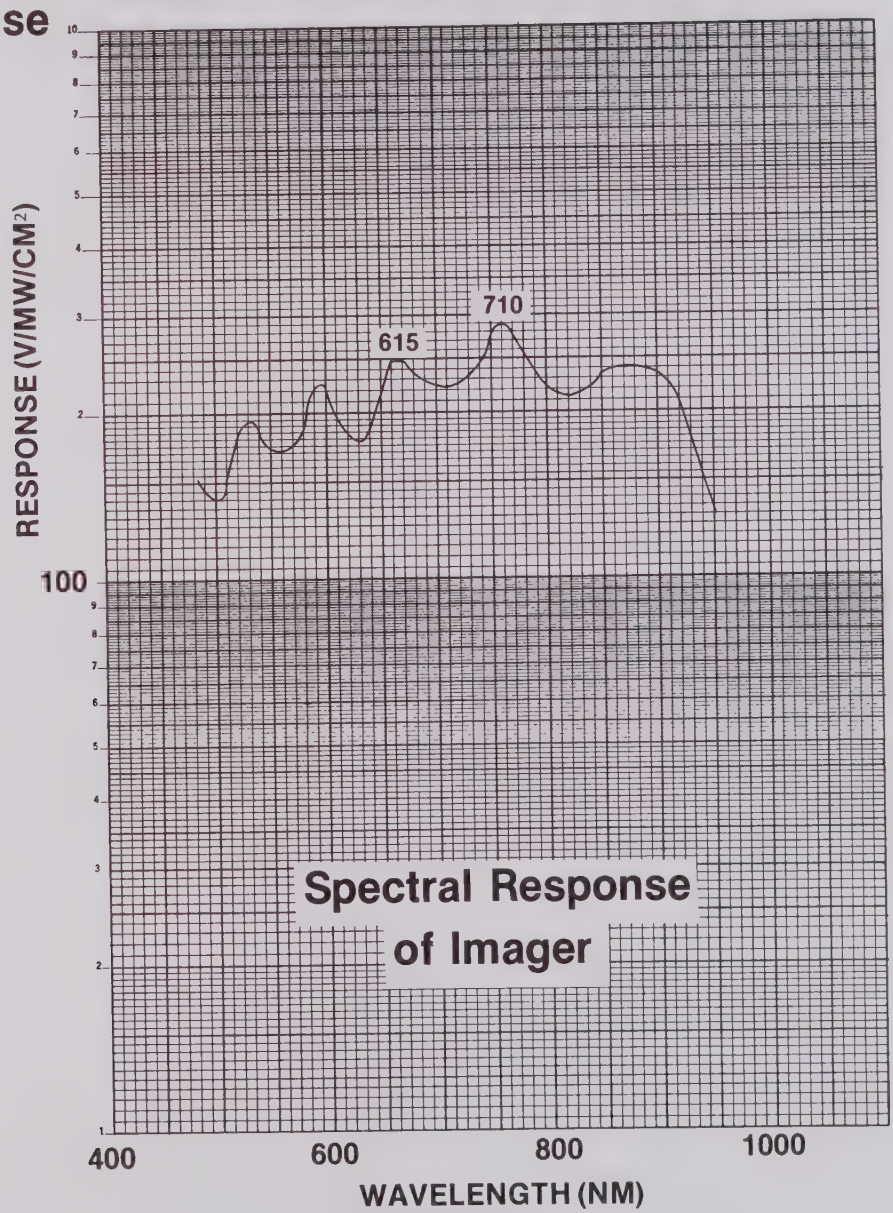
$$\text{MAGNIFICATION} \sim \frac{7.9}{\text{O.D.}}$$

NOTE:

1. ~ Means about for standard focus, i.e. special focus may be much different
2. Curvilinear distortion at field of view of:
   30° ≅ 3%
   60° ≅ 10%
   90° ≅ 25%

VideoProbe™ 2000
Characteristics

Spectral Response Of Imager



VideoProbe™ 2000
Characteristics

Radiation Testing Proves Successful

The first in a series of documented radiation tests were recently completed for Welch Allyn by Babcock & Wilcox, Lynchburg Research Center. The tests were performed with a BW-301 system (radiation resistant chip) and video taped for permanent record. Copies of this report and tapes are available on request.

The following table summarizes the results:

SOURCE	DOSE RATE (approx.)	TOTAL DOSES	EFFECT	
			Fiber	Chip
Cs-137	90 R/H	15 Rad	None	None
	160 R/H	100 Rad	None	None
	370 R/H	285 Rad	None	None
	1365 R/H	1500 Rad	Not noticeable	Very slight flickering
Spent Fuel	1,000—10,000 R/H	5,500—7,000 Rad	Turned red, then brown	White noise, useable picture
	20,000—40,000 R/H	22,300 Rad	Complete loss of light	Very noisy, upper limit of useable picture

Conclusion:

1. A hand-picked rad-resistant system will function at up to 10^4 R/H.
2. Fiber-optic illuminated systems are usable to a cumulative dose of approximately 5,000—10,000 Rad.
3. LED systems will conceivably withstand much higher cumulative doses.
4. Chip returns to normal operation after removal from the field.

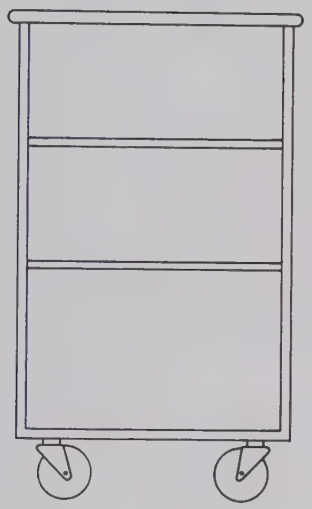
WARNING: VideoProbes described in this manual should not be used during procedures involving lasers. Contact Welch Allyn about the availability of appropriate instruments compatible with laser use.

Accessories

VideoProbe™ 2000
Instructions for Use
Mobile Cart

Cart Set-Up

Unpack Mobile Cart from its shipping container. Inspect for shipping damage and notify Welch Allyn immediately if any is found (800-327-0075; in New York State, 800-338-3663). Key (for cart doors) and probe hanger assembly are packed with cart.



Installation of VideoProbe 2000

Mobile Cart has three shelves. The top two are fixed and have access holes located in right rear corner to allow easy installation of cables and power cords inside the cart.

Position VideoProcessor on top inside shelf. A video cassette tape recorder (if used) should be installed on second shelf. Character generator can be placed on cart counter top during inspections and stored inside on top of VideoProcessor when not in use.

Connect VideoProcessor and VTR (if used) power cords and run them through access ports.

VideoProbe™ 2000
Instructions for Use
Mobile Cart

Transporting The System

The VideoProbe System transported using the Mobile Cart. Unplug all power cords, clear top of cart, and unhook video cables from back of Monitor. Place it on top of cart. Coil video cable and place on cart for transportation.

On arrival at inspection site, locate cart in most convenient position. Place monitor in best position. Interconnect video cables and plug in all power cords.

Warranty